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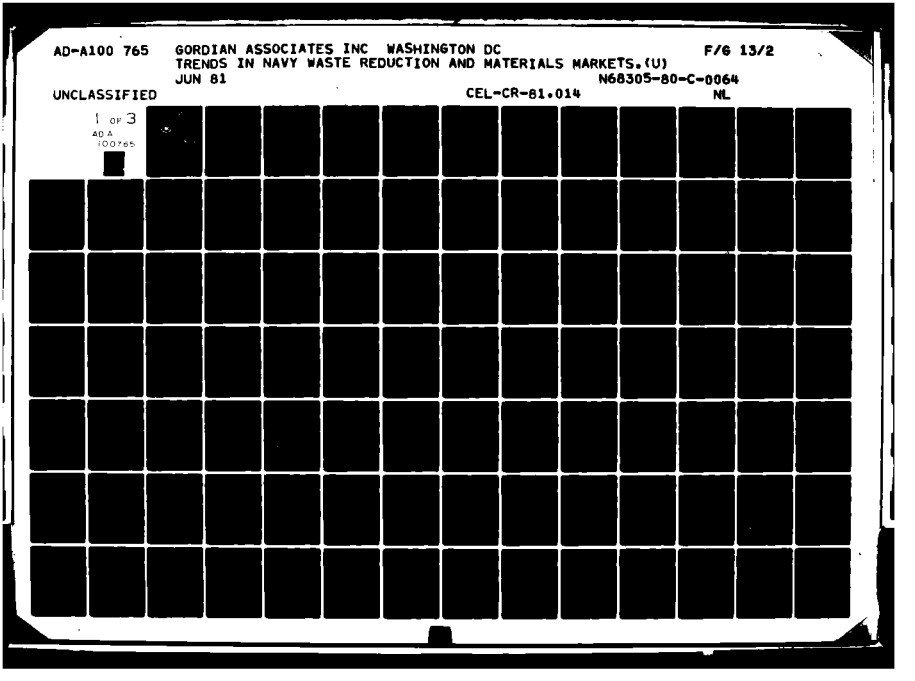

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Naval Construction Battalion Center
Port Hueneme, California

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TRENDS IN NAVY WASTE REDUCTION AND MATERIALS MARKETS

June 1981

An Investigation Conducted by

GORDIAN ASSOCIATES INC.
1919 Pennsylvania Avenue, NW
Suite 405
Washington, DC

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A review of available information on current Navy solid wastes, national laws and policies and the application, demand and economics of using secondary materials recovered from solid waste. Quantitative conclusions for the Navy solid waste stream are based on statistical projections of the size of the Navy and per capita waste generation. While paper and packaging segments

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of the solid waste streams are emphasized, detailed presentations are made for each of the identified constituents of the waste stream with market projections for the secondary materials. National and Navy statistics are presented and projected through the 1980's time frame.

An extensive bibliography on available information pertinent to the Navy solid waste stream is provided.

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INTRODUCTION

A. SUMMARY

This is a two part study of the Navy waste stream. The first part deals with trends in waste generation (quantitative) and composition (quantitative and qualitative) and the second part discusses trends in the markets for those constituents which may be recovered from the Navy waste stream.

The approach used was to analyze national trends in these areas using the large body of information available dealing with solid waste generation, constituency, resource recovery and secondary materials markets. This information was sifted for those facts pertinent to projecting the behavior of the Navy waste stream and to identify those factors common to both the national and Navy waste streams, particularly in the area of secondary materials markets.

Quantitative conclusions for the Navy waste stream were based on statistical projections of the size of the Navy and per capita waste generation. A second method for producing data on the characteristics of the Navy waste stream has been developed using floor space data and waste characteristics as related to floor space classification and can be made available for accurate quantification of the factors critical to analysis of the Navy waste stream. (See Section A.1 of Part I, SRI Approach.)

The study has examined the information available and pertinent to the Navy waste stream and provides a comprehensive bibliography.

A presentation is made of laws, regulations and policies affecting Navy waste, with an assessment of their real impacts, present and future.

Emphasis was placed on the paper and packaging segments of the waste stream with their contribution to the volume of waste and consequent recovery potential the principal concerns.

Detailed presentations are made for each of the identified constituents of the waste stream with explanations of market specifications for secondary materials.

National and Navy statistics are presented and projected through the 1980s. These projections then provide the basis for analysis of the markets for recoverable materials through 1990.

The market analysis section deals individually with each constituent of the waste stream considering the variability of value with

respect to form, quantity, and quality and examining market conditions, present and future, on a national and regional basis.

Projections are made for future utilization of recovered material and a sample economic analysis is provided for reference.

B. CONCLUSIONS

The findings of this study are divided into the same two parts as the study is: trends in waste generation and composition and trends in the markets for potential constituents.

Projection of the volume of the Navy waste stream growth from 1,493 TPD in 1980 to 1,696 TPD in 1990, while sound, is based on the extrapolation of a small data base. The technique of using floor space data to estimate waste generation would assure greater accuracy and also require expansion of the data base used for constituency projections. Further sampling at regionally and functionally diverse naval facilities prior to a commitment to resource recovery may refine the estimate of available resources.

The available data on constituency indicate that the Navy waste stream is approximately 90% paper and will remain so through 1990. Paper should be the focus of any resource recovery program.

Markets for the various constituents of the waste stream are in a growth stage. Except for plastics each of the primary waste categories (paper, glass, ferrous, non-ferrous, plastics) show potential for economically feasible resource recovery by the mid 1980s. However, ferrous and glass show the least potential for revenue because of the lower cost/ton of recovered material and high transportation costs.

Aluminum, while bringing higher and higher dollar/per/ton, will not appear in the Navy waste stream in sufficient quantities to merit a recovery program.

Paper appears in such quantity and at such high quality due to office input that it is an extremely valuable resource and growing more so daily. A conservative program of 35% recovery of pages could net the Navy, including disposal offset, $19 million in 1990.

PART I:

TRENDS IN NAVY WASTE GENERATION RATES AND COMPOSITION

PART I: TRENDS IN NAVY WASTE GENERATION RATES AND COMPOSITION

A. CURRENT NAVY WASTE

1. Assembling a Total Waste Figure

Methodology

The generation of non-industrial trash within Naval facilities may be quantified in terms of overall tonnage and qualified in tons of separable constituents of the waste stream. Tracking of trends in either of these considerations should be based on historical data, prior behavior being the basis for extrapolation into the future. In the absence of such records it is necessary to identify another basis for describing the volume and composition of waste using factors which most closely represent elements contributing to the waste stream.

An approach which is accepted in projecting waste generation on a national or public level is to tie a per capita rate to the population and project the waste stream as a function of population. Recent EPA figures show the national average to be approximately 3.77 lb/person/day[181] and increasing at less than 3% per year. Population projections are provided in great detail by the Bureau of the Census.

Other factors to be considered in such a projection are variations in climate (regional), varying economic status of contributor to the waste stream, seasonal variations and societal influences.

In the case of a specific waste stream, such as the Navy's, other factors enter into the picture. The waste stream under consideration may be skewed, compared to the general waste stream, in the makeup of its contributors.

A military base is necessarily going to generate a disproportionately large percentage of office-type trash because a major part of its population is only there during the day. Food waste will be of an atypical nature with the largest meal being lunch which is served on an institutional format.

While proportional trends in the makeup of the waste stream will follow patterns which can be established for the national waste stream, the overall quantities of given waste constituents will be disproportionate because of the skewing of the military waste stream towards office and institutional waste.

SRI Approach

To overcome the problem in projecting trends in real tonnage for the Navy, a technique for tying the skewed nature of the waste of the

local population to its type of activity has been devised. In a report of May 1980 by SRI International to CEL, a technique whereby the size and constituency of the Navy waste stream is tied to the usable floor space within naval facilities is described. (See Appendix D).

Catagories of floor space are identified and broken down into eleven categories:

- o Housing
- o Office
- o Industrial
- o Commercial
- o Medical
- o Food Service
- o Storage
- o Recreation
- o Ships
- o Dormitories
- o Treatment Plants

All the buildings in all naval facilities in the nation fall into one of these categories.

The Navy has recorded floorspace and coded it in a form which allows it to be divided into these categories. It is thus possible to develop a total number of square feet in each catagory for the entire Navy.

By statistical sampling, typical generation rates in tons per 1000 square feet for each category have been developed so that quantity estimates are tied to activities within given facilities. Further, typical distribution of waste categories have been developed for each category in similar statistical fashion so that amounts of specific waste constituents can be described in tons. Because of the form in which data is stored it can be used both for single facility or regional considerations and for the Navy as a whole.

2. Applications Within the Navy

General

In order to adequately represent the size and consistency of the Navy waste stream, figures for the entire Navy will be developed using the population-basis technique described above. The statistics may need to be brought current by tying the constituent totals as determined for 1977 to national constituency trends and readjusting them to represent proportional changes in the percentage of given constituents. These numbers can then be tied to Navy population figures for 1977 and extrapolated to 1980. This assumes an even distribution of personnel changes over the different waste generating catagories.

Regional

To provide an understanding of the variability of the waste stream from a constituent and per capita standpoint on a regional basis, selected Naval facilities from around the country will be examined individually. The regions and bases to be considered are:

- o Philadelphia - Philadelphia Naval Shipyard
- o Norfolk - Norfolk Naval Base
- o Chicago - Great Lakes Naval Base
- o San Diego - Miraman Naval Air Station
- o San Francisco - Treasure Island Naval Base

These provide variety of representation in region, climate and primary activities for the Navy.

3. Personnel Considerations

Population

The use of population as an index to the size of the waste stream is a useful approach to general waste generation estimation. When applied to military facilities, though, it will provide accuracy only in gross tonnage estimates. This is, as noted above, because of the skewed nature of the waste constituency as compared to the national waste stream.

If real figures could be made available on the magnitude and constituency of the military waste stream a good per capita generation statistic could be determined. In the absence of this information population can only be used as a basis for projection of growth for the military waste stream. It becomes one of the factors among social, legislative, and economic considerations in plotting trends.

Income

A factor used in estimation of the waste stream size among selected populations, which might be significant in a regional estimate, is the income distribution over a given population. In a case where average income of a population segment differs significantly from that of the overall population a variance in the per capita waste generation rate can be expected. Shifts in constituency may also be expected but difficult to accurately characterize statistically.

Regionalization

Regional concentrations of personnel may also exhibit trends away from the overall average in both quantity and constituency. This behavior is well documented on a national basis and Navy estimates may be adjusted proportionately by superimposing statistical deviations in a

given area from national averages onto proportionate naval statistics for that area.

4. Composition

The composition of the waste stream may be described by separating the components into catagories, the designation of which is somewhat arbitrary. The categories selected for this study are:

- o Paper
- o Ferrous Metal
- o Non-ferrous Metal
- o Glass
- o Plastics
- o Other (primarily food and yard waste)

Each of these categories is comprised of subcategories which may fluctuate independently in contribution to the waste stream. Hence, a category may maintain its contribution level while shifting the balance of its constituency. In two cases, glass and paper, examination of sub-categories will yield significant insight into the patterns to be expected in their contribution to the waste stream.

National

Recent EPA constituency figures[181] on a national basis for post-consumer waste, both residential and commercial are as follows:

o Paper	34.4%
o Metals (ferrous and non-ferrous)	9.1%
o Glass	10.2%
o Plastics	3.9%
o Other	42.4%

These percentages will serve as a basis for comparison of those determined for the Navy.

Navy

The current data available on constituency on the naval waste stream consists of a detailed analysis[506] of waste generated at the U.S. Naval Air Station at North Island, California. The limitations of using this data are shown in that a comparison of typical bulk densities of waste from other facilities yield an average value for North Island which is 13% below the combined averages of the others. While this level of error may be acceptable in plotting trends in the waste stream it is apparent that better numbers could be obtained from a broader data base.

The results of the North Island survey show the following constituency (see Appendix A):

- Paper - 89%
- Metals - 1%
- Glass - Trace
- Plastics/ Rubber - 0.5%
- Other - 9%

As can be seen and as is predicted for military facilities the major constituent, by far, of the waste stream is paper. In the North Island survey paper was subdivided into paper and cardboard which represented 61% and 28% of the total respectively.

Historical

Returning to national figures,[181] EPA history shows trends in the constituency of the national waste stream as follows:

	1960	1970	1978
Paper	30.7	33.8	34.4
Metal	10.8	9.4	9.1
Glass	7.3	9.4	10.2
Plastics	.04	2.5	3.9
Other	51.2	44.9	42.4

As can be seen, there is little connection between the national figures and those for North Island and probably the Navy as a whole. The great predominance of paper in the Navy waste stream identifies that as the constituent meriting greatest consideration.

5. Hybrid Estimation Technique

Obstacles to obtaining the floorspace data at the time this report was prepared require the use of a hybrid technique for predicting the size of the Navy waste stream.

Through a survey of public affairs officers at the five designated regional bases, estimates of daytime staff on base were obtained. These data were presented both as combined military and civilian and separated. A civilian cross-reference was obtained from the Department of the Navy Civilian Personnel Command via the NARDAC executive system. A military cross-reference was obtained from the Department of the Navy Bureau of Naval Personnel (see Appendix B).

Waste volume data was obtained independently from public works departments on the selected bases. These data were combined and reduced to a TPD figure (see Appendix C).

The basis for estimating the size of the Navy waste stream was by dividing the size of the waste stream by the total number of daytime base inhabitants, both military and civilian, to yield a lb/day/person rate. Using the total Navy personnel figures from both the military and civilian statistics, combining them and multiplying by the computed daily rate for the selected facilities, yields a cross-estimate of the total Navy waste production rate.

Total Population of the Selected Facilities (see Appendix B):

Civilian - 52,087	⎫	
	⎬	Ratio = 0.78:1
Military - 66,574	⎭	
TOTAL 118,661		

Total Waste Production in Tons Per Day of the Selected Facilities (see Appendix B):

97,684 TPY x 2,000 lb/ton = 195,368,800 lb/yr
= 535,254 lb/day

Daily Per Capita Waste Production:

535.254 lb/day ÷ 118,661 persons = 4.51 lb/person/day

Total Continental U.S. Navy Population:

Civilian: 281,974	⎫	
	⎬	Ratio = 0.74:1
Military: 380,233	⎭	
TOTAL 662,207		

Total Daily Waste Production:

662,207 persons x 4.51 lb/person/day = 2,985,553 lb/day
= 1,493 TPD

B. GOVERNMENT INFLUENCES

Federal involvement in solid waste management has evolved through three major Acts: the Solid Waste Disposal Act of 1965, and its amendments, the Resource Recovery Act of 1970 and the Resource Conservation and Recovery Act of 1976 (RCRA). Legislation to reauthorize RCRA through fiscal year 1982 was passed by Congress in October 1980 with additional amendments. Several other federal acts have also had an influence on solid waste management, although to a lesser degree.

The chief objectives of RCRA are:

- o Regulation of the management of hazardous wastes from point of generation through disposal, by EPA or by state programs authorized by EPA;

- o Regulation of the disposal on land of all other solid wastes by the states in accordance with minimum federal criteria; and

- o Establishment of resource recovery and conservation as the preferred solid waste management approach.

The Act requires or authorizes a number of activities directed toward achieving these objectives: federal regulations and guidelines; financial and technical assistance to state and local governments; research, demonstrations, and studies; and public participation and education.[166] Executive Order 12088, dated October 1978, spelled out in more detail the responsibility of federal facilities to comply with federal environmental laws such as the paper recycling and beverage guidelines.

As the planning and enforcement mechanisms set in motion by RCRA go into effect, the Council of Environmental Quality estimates that the cost of compliance with existing and proposed environmental standards for municipal solid waste disposal will almost double the average cost of disposing of a ton of waste at a sanitary landfill by the mid-1980s.[117]

A number of state and local laws and DOD policies and directives have also evolved, either directly or indirectly influenced by these Federal Acts. All of these laws and regulations can influence the amount and constituents of the waste stream by encouraging waste reduction, by encouraging recycling by municipalities and federal facilities, and by stimulating recycling efforts in the manufacture of raw materials and manufactured products.

1. Paper Recycling Guidelines for Federal Facilities

In 1976 EPA issued guidelines requiring all federal offices with 100 or more employees to set aside waste paper for recycling. The same guidelines required federal facilities housing 500 or more families, such as military bases, to recycle newspapers, and commercial establishments generating 10 tons of corrugated to sell the material for recycling. In March 1979, 145,000 federal employees working in 135 facilities were participating in the program and about 15 state governments were carrying out office source separation programs for waste paper recovery as of May 1978.[117] A copy of the guidelines is included in Appendix F. Yearly reporting by all federal agencies on the status of compliance is also required by these guidelines.

2. Beverage Container Legislation: State and Federal

Legislation that mandates a minimum, refundable deposit for all containers used in the sale of beer and soft drinks is one legislative option for reducing the rate of solid waste generation. The objectives of mandatory beverage container legislation are:

i. To reduce the number of beverage containers that become littered;

ii. To reduce the amount of natural resources, both materials and energy, devoted to beverage delivery;

iii. To reduce the amount of beverage container materials that enter the waste stream; and

iv. To establish a public symbol of conservation.[160]

A container deposit is an incentive for the return of containers, which can then be more easily collected at a central collection point for reuse or recycling. Under authority granted it by the Resource Recovery Act of 1970, EPA issued guidelines in 1976 requiring a refundable 5¢ deposit on all beer and soft drink containers sold at federal facilities, except in cases where costs would be excessive. A copy of the guidelines is included in the Appendix.

A DOD-EPA joint Executive Agency Task Force was set up to conduct a test of the effectiveness and impact of the guidelines at 10 military bases for a one-year period ending June 1978, and Franklin Associates, Ltd. was awarded a contract to supervise, administer and test implementation procedures.

The guidelines describe criteria for an agency's nonimplementation decision and specify three conditions that will be necessary to meet the objectives of the guidelines:

a. That consumers continue to purchase beverages from dealers at federal facilities;

b. That empty containers be returned and then reused or recycled; and

c. That the costs of implementation are not prohibitive.

While actual return rates for the containers were quite good, ranging between 68% and 93% at the 10 bases, on-base beverage sales declined 13% to 56%. Non-aluminum containers were not recycled to any degree during the test due to the nonavailability of an economical market. The Department of Defense recommended nonimplementation of the guidelines, and decided against the selective implementation recommended by the contractor, because conditions of the guidelines were not achieved, with the exception of return rates.[509] The Task Force did state,

however, that all DOD installations will continue to actively implement state deposit laws in those states where laws have been enacted by state legislatures.

As noted in Appendix H, to date seven states have passed and implemented some form of beverage container deposit legislation and several others have passed some form of restrictive packaging legislation which affects the type of packaging which can be sold (i.e., bans on sale of beverage containers with detachable pull-tabs or beverage containers connected with plastic or other nondegradable devices). The seven states with deposit legislation are: Connecticut, Iowa, Maine, Michigan, Oregon and Vermont.

Interest continues in this form of legislation on both a state and national level. Many states have passed litter reduction/recycling bills in addition to, or instead of, container deposit legislation. A summary of these bills, by state, is also included in Appendix H. These laws may affect generation and composition of waste through financial support of recycling programs and mandated education programs.

3. DOD/Navy Policies and Directives

Policies of the Navy Supply Systems Command with regard to procurement of end items as well as packaging material specifications were not available to us as of this writing and have not yet been reviewed.

Department of Defense Directive Number 4165.60 on Solid Waste Management - Collection, Disposal, Resource Recovery and Recycling Program updates DOD policies and procedures and incorporates DOD responsibilities in accordance with guidelines published by EPA, and from the National Environmental Policy Act and the Solid Waste Disposal Act. It reviews general, organizational and financial management procedures for recovering materials from the waste stream, as well as procedures for procuring equipment items required for the establishment of recycling programs, and details staff responsibilities and reporting requirements. DOD's oil recycling and re-use policy memorandum, dated June 4, 1979, gives additional information about policy with regard to recovering this additional material from the waste stream.

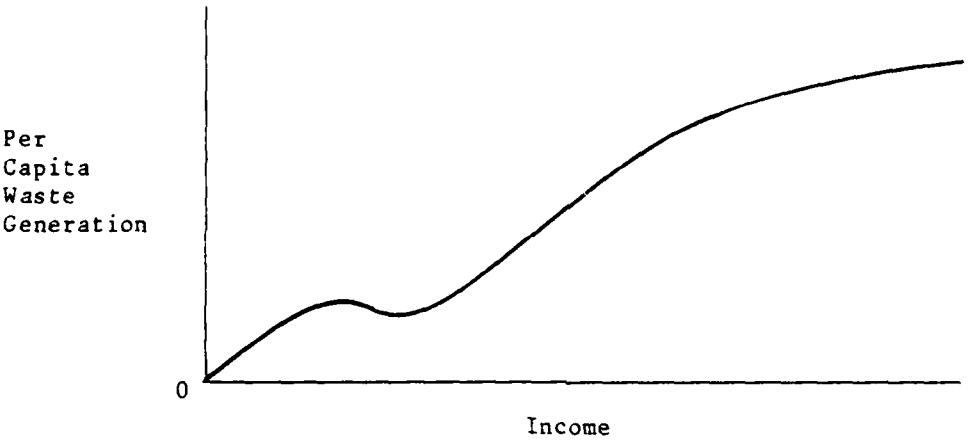
C. NON-GOVERNMENTAL INFLUENCES ON VOLUME AND COMPOSITION

1. Population Growth

Clearly the major influences on the waste stream, Navy or national, emanate from non-governmental sources. As indicated in the sections where waste generation rates are projected, the largest single influence on quantity is population growth. In addition, the consumption habits of the population will determine the per capita waste generation rate. These habits are affected mainly by economic and technological factors.

2. Income Level

Per capita waste generation can be related to income. The economic level of a given population serves as an index to the quantity (and composition) of waste generated. While no data will be cited in this report, a general description of that relationship is as follows. Per capita waste generation increases sharply in the low income brackets then decreases slowly in the lower-middle income levels. This decrease represents the economics of consumption whereby households in the lower-middle income range have an advantage (i.e., more meals prepared at home) over low-income groups. At the middle-income level and beyond, the generation rate increases with income to a maximum which holds constant thereafter.[195]



3. Cost of Goods

Selection by consumers of items which will reach the waste stream is greatly influenced by their cost. The best example is packaging which, in the national waste stream, forms a huge (30%+) segment. Manufacturers select the most economic materials for a given application and as cheaper materials are developed, they will begin to appear in the waste stream and displace others.

4. Industrial Organization

Each segment of the packaging industry is represented by a strong industry group advancing the interest of their constituent.

Industries will identify market erosion by a competing material and try to introduce technical and commercial developments to affect their loss of market share and perhaps induce a gain in market share.

5. Metals

The battle between aluminum and steel in packaging soft drinks and beer is a good example of market displacement. These industries are mounting a concerted effort to develop cheaper and more easily recyclable packages. As one succeeds more than the other, a shift can be expected in waste stream constituency.

6. Paper

The paper industry is faced with a unique situation in that its product is both recyclable and a potential energy source. As the recovery of energy from paper is developed the trade off between pulp mills and incinerators will reach a balance based on economics. With the cost of energy moving upward, source separation or allocated paper recovery lose their positions in relation to incineration.

7. Glass

Glass packaging will remain in competition with metal container and lose some share as the cost of transporting the extra weight of glass rises. Glass has a unique position in packaging because of its preferable characteristics in many applications. Further, the cost of "raw materials" in glass making is low although energy input is significant.

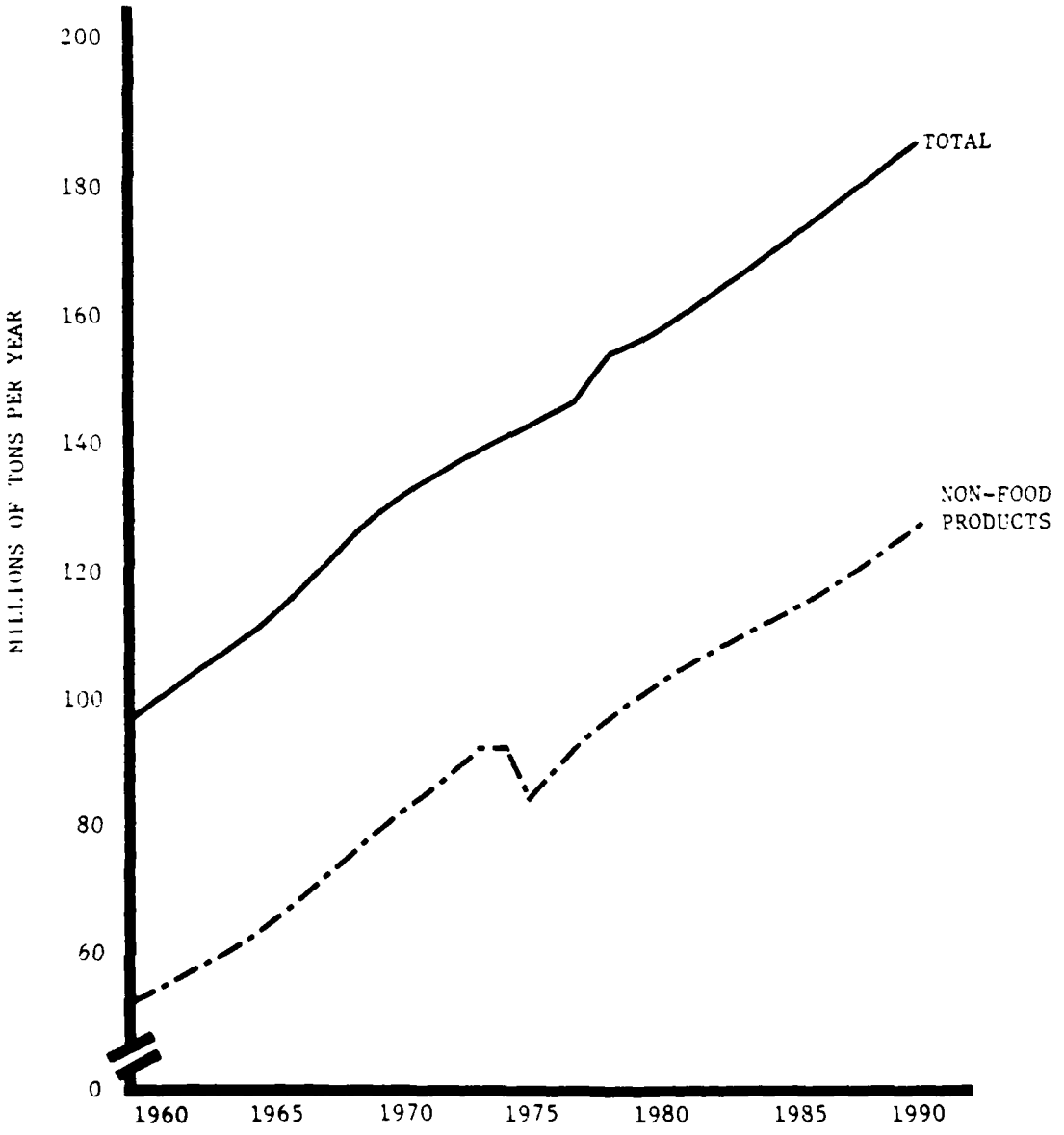
D. TRENDS IN COMPOSITITON AND GENERATION RATES

Introduction

Most of the data on national municipal solid waste trends in this section of the report is taken from as-yet unpublished U.S. EPA data prepared by Franklin Associates, Ltd. Updated in June 1980, the statistics shown in Appendix E and plotted in Figure I-D-1 represent EPA's most recently updated estimates of gross discards by material and product category for the period 1960-1990.[181] These estimates of post-consumer residential and commercial wastes found in municipal collections were arrived at by using a material flows estimating procedure.[122] The material flows approach uses detailed U.S. government and industry trade association statistics on material consumption and product shipments to household and commercial sectors. It provides fairly accurate estimates for most of the manufactured goods components of the waste stream, but food and waste estimates are only rough approximations.[126]

FIGURE I-D-1

NATIONAL
POST-CONSUMER SOLID WASTE



Source: U.S. EPA, June 1980.

Per Capita Generation Rates

As shown in Table I-D-1, gross discards increased from 2.9 pounds per person to 3.8 pounds per person per day in 1978 and per capita generation growth slowed markedly after 1973.

Correspondingly, growth rates in U.S. raw material consumption and material consumption per dollar of GNP have been declining in recent years (see Tables I-D-2 and I-D-3). However, the fact that the growth in materials consumption and waste generated per dollar of GNP and per capita appears to be slowing only partially compensates for the power of compound growth[161, p.24] and therefore tonnage increments remain high, as shown in Table I-D-1.

The waste generation projections shown in Table I-D-4 represent three projections for 1985 and 1990 per capita discards. The first, and lowest, growth trend projections represent simple future extrapolation of the estimated 1973-1978 annual growth rate, during a period of slow economic growth. The Franklin Associates, Ltd. projections are slightly higher. The International Research and Technology projections assume a higher than historical growth rate for the economy and very active substitution favoring lighter materials.[181] All three projections are considerably lower than EPA's previously published Baseline Projections (1975), compiled before the decreased growth trend from 1973-80 was apparent.

As the Resource Conservation Committee points out in its Final Report to Congress in 1979, it is not clear whether material consumption relative to GNP and per capita growth rate will continue to decrease, stabilize, or return to the high rates of the 1950s and 1960s. A continued long-term decrease would be major change from past economic trends.[161]

Composition Trends

With regard to trends in composition of municipal solid waste, paper and plastics are increasing as a percentage of gross discards, glass and metallics are projected to decrease slightly from 1980-1990, and other manufactured materials have remained fairly stable. Total organics continue to be about 80 percent of the gross discards, although the percentage of food and yard wastes is decreasing markedly (see Table I-D-5).[181]

MSW Content Relative to Total U.S. Consumption

The consumer disposes of products only after a certain lapse of time, which is the service life of the product. For example, plastic packaging, novelties, disposables, etc. have a short service life (less than one year). Other items, such as plastics, furniture, sporting goods and luggage have estimated service lives of six to ten years, and plastic products such as instruments, hardware and various machinery can serve for 11-20 years.[114] It is those items having the shortest

TABLE I-D-1

TREND IN POST-CONSUMER RESIDENTIAL AND COMMERCIAL SOLID WASTE GENERATION AND DISPOSAL, 1960 - 1978

	1960	1965	1970	1972	1974	1976	1978
Gross discards							
Million tons/year	95.7	110.7	131.0	138.5	143.1	143.2	150.4
Pounds/person/day	2.90	3.12	3.50	3.63	3.70	3.65	3.77
Resource Recovery							
Million tons/year	6.1	6.4	7.7	8.4	10.5	10.7	12.4
Pounds/person/day	0.19	0.18	0.20	0.22	0.27	0.28	0.31
Net Disposal							
Million tons/year	89.6	104.3	123.3	130.1	132.6	132.5	138.0
Pounds/person/day	2.72	2.94	3.30	3.41	3.43	3.37	3.46
Population (millions)	180.7	194.3	204.9	208.9	211.9	215.2	218.7

TABLE I-D-2

TRENDS IN U.S. CONSUMPTION
OF MAJOR RAW MATERIALS AND FUELS, 1948 - 1978

	Quantities Consumed (Millions of tons per year except as noted)				Percent Growth			
	1948	1958[1]	1968	1978	1948-1978	1948-1958	1958-1968	1968-1978
Ferrous Metals[2]	62.9	71.5	107.3	115.0	83	14	50	7
Aluminum	0.8	2.2	4.7	6.0	650	175	114	28
Copper, Lead and Zinc	3.4	4.0	5.2	5.0	47	18	30	-4
Building Materials[3]	580.1	1,291.0	1,812.8	2,020.6	248	123	40	11
Other Non-Fuel Minerals[4]	31.9	49.4	91.0	106.8	235	55	84	17
Forest Products								
Lumber, Plywood & Veneer[5]	6,000.0	6,240.0	7,680.0	8,700.0	45	4	23	13
Pulp, from Roundwood	15.0	20.4	28.1	30.5	103	36	38	9
Plastic Resins	0.7	2.5	8.6	18.8	2,420	240	240	118
Coal	531.1	366.7	498.8	618.0	16	-31	36	24
Petroleum[6]	2.1	3.3	4.8	6.8	224	57	45	42
Natural Gas[7]	4.9	10.8	19.5	19.4	293	118	81	0
Gross National Product (billions of 1972 dollars)	487.7	697.3	1,051.8	1,385.3	184	43	51	32
Population (millions)	146.6	174.9	200.6	218.4	49	19	15	9

[1] Except for forest products and fuels, 1958 figures are annual averages of 1956 through 1960.
[2] Steelmill shipments plus imports net of exports.
[3] Sand and gravel, crushed stone, and cement.
[4] Phosphate rock, lime and salt.
[5] Expressed in millions of cubic feet of roundwood needed to supply actual output.
[6] Expressed in billions of barrels.
[7] Expressed in trillions of cubic feet.

Source: Resource Conservation Committee staff, based on statistical sources listed under Table 4.

TABLE I-D-3

TRENDS IN U.S. MATERIAL AND ENERGY USE
RELATIVE TO TOTAL NATIONAL PRODUCT AND POPULATION
1948 - 1978

	Tons Consumed per $ Million of Gross National Product (1972 Dollars)			
	1948	1958	1968	1978
Ferrous Materials	128.9	102.5	102.0	83.0
Aluminum	1.6	3.1	4.4	4.3
Copper, Lead and Zinc	7.0	5.7	4.9	3.6
Building Materials	1,189.4	1,851.4	1,723.5	1,458.6
Other Non-Fuel Minerals	65.4	70.8	86.5	77.1
Lumber, Plywood and Veneer[1]	12.3	8.95	7.3	6.3
Pulp from Roundwood	30.8	29.3	26.7	22.0
Plastic Resins	1.5	3.6	8.2	13.6
Coal[2]	1,089.0	525.9	474.2	446.1
Petroleum[3]	4,335.0	4,754.0	4,553.0	4,924.0
Natural Gas[3]	10,140.0	15,430.0	18,500.0	14,010.0

	Pounds Per Person Per Year			
	1948	1958	1968	1978
Ferrous Materials	858.1	817.6	1,069.8	1,053.1
Aluminum	10.9	25.2	46.9	54.9
Copper, Lead and Zinc	46.4	45.7	51.8	45.8
Building Materials	7,914.0	14,762.7	18,073.8	18,503.7
Other Non-Fuel Minerals	435.2	564.9	907.3	978.0
Lumber, Plywood and Veneer[4]	40.9	35.7	38.3	39.8
Pulp, from Roundwood	204.6	233.3	280.2	279.3
Plastic Resins	10.1	29.0	85.9	172.2
Coal[5]	7,245.6	4,193.3	4,973.1	5,659.3
Petroleum[6]	605.6	796.0	1,002.7	1,307.7
Natural Gas[6]	33.7	61.5	97.0	88.9

[1] Thousand cubic feet of roundwood per million dollars.
[2] Barrels per million dollars.
[3] 1,000 cubic feet per million dollars.
[4] Cubic feet of roundwood per person per year.
[5] Gallons per person per year.
[6] 1,000 cubic feet per person per year.

Source: Resource Conservation Committee Staff, based on Mineral Commodity Summaries 1979 and Minerals Yearbooks 1948, 1958, and 1968, Bureau of Mines, U.S. Department of Interior; The Demand and Price Situation for Forest Products, 1976-77, Forest Service, U.S. Department of Agriculture; Monthly Energy Review, March 1979, Energy Information Administration, U.S. Department of Energy; Facts and Figures of the Plastics Industry, 1978, and personal communications from the Society of the Plastics Industries.

TABLE I-D-4

FUTURE PROJECTIONS OF POST-CONSUMER RESIDENTIAL AND COMMERCIAL SOLID WASTE GENERATION FOR 1985 AND 1990

Source (Annual growth rate)	1978	1985	1990
	(million tons per year)		
1973-78 Growth Trend (1.04%/yr)	150	162	170
Franklin Assoc., Ltd. (1.8%/yr)	150	170	187
International Research & Technology (2.6%/yr)		186	212
	(Pounds per person per day)		
1973-78 Growth Trend	3.77	3.82	3.83
Franklin Assoc., Ltd.	3.77	4.01	4.20
International Research & Technology		4.37	4.77

TABLE I-D-5

PERCENTAGE TREND IN COMPOSITION OF U.S. POST-CONSUMER RESIDENTIAL AND COMMERCIAL SOLID WASTE STREAM, 1960 - 1990.

(Percent of as-generated wet weight of gross discards before recycling)

Materials	1960	1970	1978	1990
Paper	30.7	33.8	34.4	35.9
Plastics	0.4	2.5	3.9	6.0
Wood	3.1	3.0	3.2	3.5
Rubber, leather, and textiles	4.4	4.8	4.6	4.8
Subtotal: Mfgr. Product Organics	38.7	44.2	46.1	50.2
Food and yard waste	41.7	34.6	33.2	29.9
Subtotal: all organics	80.5	78.8	79.3	80.2
Metallics	10.8	10.4	9.1	8.8
Glass	7.3	9.4	10.2	9.6
Misc. inorganics	1.5	1.4	1.4	1.4
Subtotal: all inorganics	19.5	21.2	20.7	19.8
Total Waste	100.0	100.0	100.0	100.0

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20 ABSTRACT (Continue on reverse side if necessary and identify by block number)

A review of available information on current Navy solid wastes, national laws and policies and the application, demand and economics of using secondary materials recovered from solid waste. Quantitative conclusions for the Navy solid waste stream are based on statistical projections of the size of the Navy and per capita waste generation. While paper and packaging segments

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of the solid waste streams are emphasized, detailed presentations are made for each of the identified constituents of the waste stream with market projections for the secondary materials. National and Navy statistics are presented and projected through the 1980's time frame.

An extensive bibliography on available information pertinent to the Navy solid waste stream is provided.

service life that appear most frequently in municipal solid waste. Thus, those materials whose largest end use markets are short service life products will have higher impact on solid waste constitutency. Packaging is a primary example of this relationship and Figure I-D-2 shows the relationship of packaging by material categories to the non-packaging portion of the waste stream. In contrast, Figure I-D-3 shows primary waste constituents, including packaging, as a percentage of the waste stream. Table I-D-6(a) compares material and energy content of municipal solid waste to total U.S. consumption, rather than gross discards.

Table I-D-6(a)[160]

COMPARISON OF MATERIALS CONTENT OF MSW
TO TOTAL U.S. CONSUMPTION IN 1975

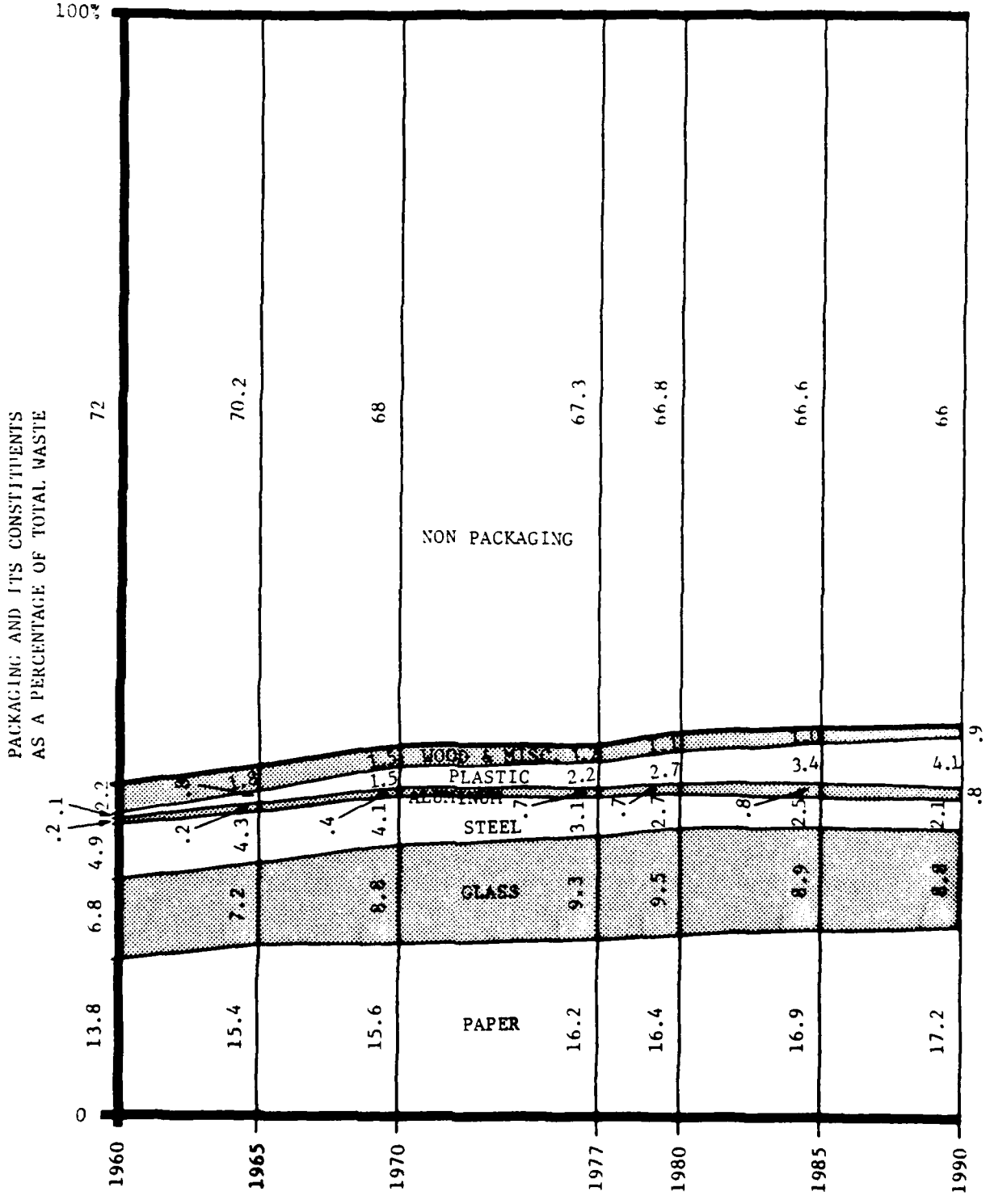
MSW component	MSW content as a percentage of consumption [a]
Ferrous metal	12
Aluminum	22
Other nonferrous metal	5
Glass	69
Paper	67

[a] MSW as discarded. Some portions of each material are recovered for recycling before disposal.

Regional Variation

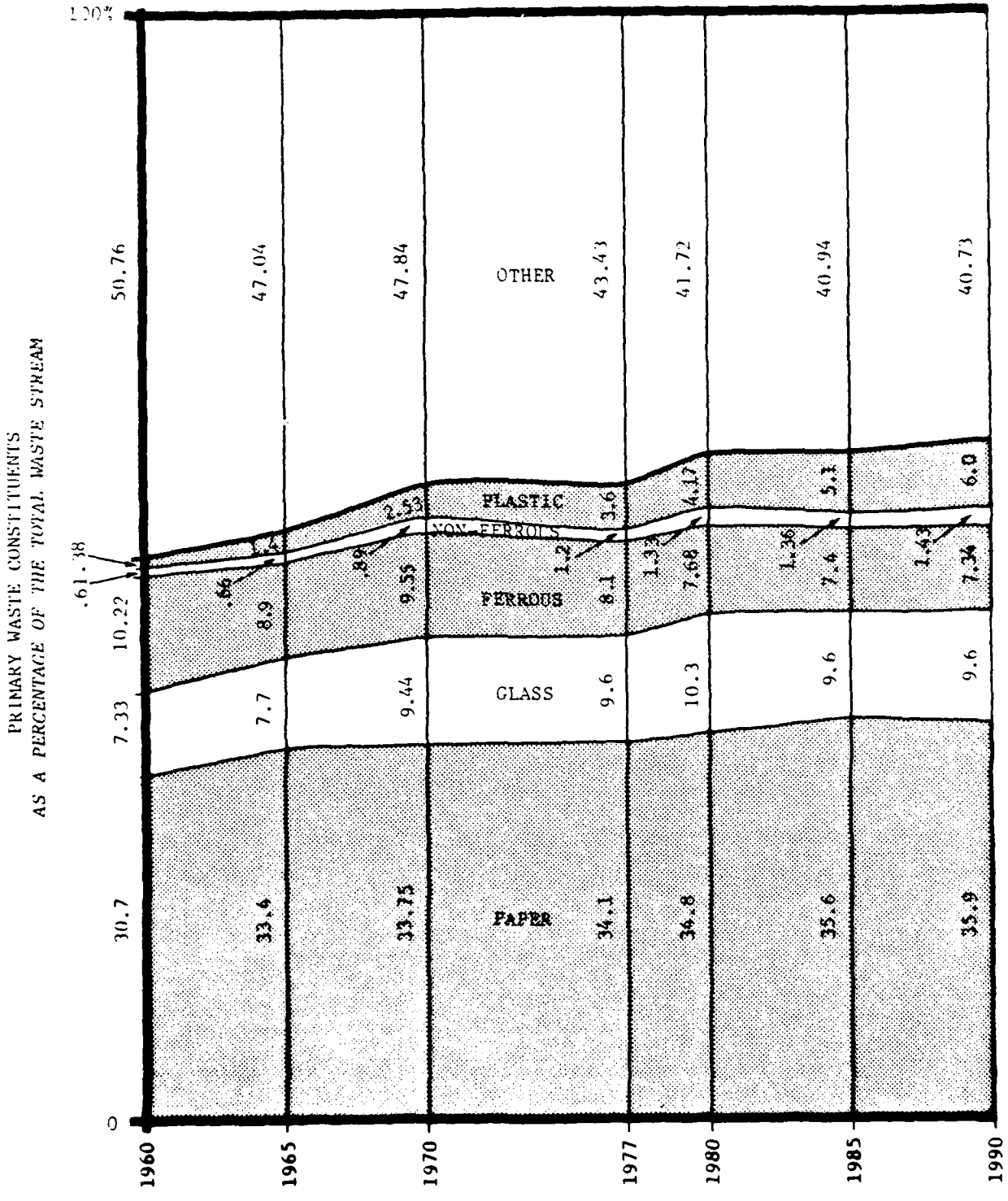
The U.S. EPA estimates represent nationwide totals or averages, and with the exception of Table I-D-1, tonnage figures represent gross discard estimates, before the impact of any recycling efforts. Since there is considerable regional variation in waste generation, collection, and recycling rates, adjustments must be made to account for local circumstances. States with container deposit legislation, for example, experience considerably reduced container materials in the waste stream. The most recent source documenting this reduction in container materials is a Report by the Comptroller General of the United States, published December 11, 1980. Entitled States' Experience with Beverage Container Deposit Laws Shows Positive Benefits, the report notes, for example, that Maine experienced an 84% decline in the beverage container portion of municipal solid waste after container legislation was instituted.

FIGURE I-D-2



Source: Franklin Associates for U.S. EPA, 1980.

FIGURE I-D-3



Source: Franklin Associates, June 1980.

Lighter-Weight Products/Packaging

Trends to lighter weight materials, both through improved material technology and material substitution, have also impacted on waste stream composition and weight and contributed to the overall decrease in waste stream tonnage. In soft drink containers, this trend is combined with a major increase in family size containers, as noted in Table I-D-6(b).

1. Paper

Paper (and paperboard) as a percentage of municipal gross discards increased from 30.7 in 1960 to 33.8 in 1970. The increase continued, at a slower rate, from 1970 to 1980, when paper represented 34.4% of gross discards, and this slower growth trend is expected to continue to 1990 when paper is estimated to be 35.9% of gross discards.[181]

Correspondingly, paper and paperboard consumption has also decreased. Unlike some other materials with many long-life product markets, a high percentage of paper and paperboard markets are non-durable goods, containers or packaging. Industry growth is closely related to changes in the real Gross National Product. However, prior to 1973 the correlation averaged 53,000 tons for every billion dollars of real GNP. After 1975, a reduced consumption trend relative to real GNP developed, with the new ratio averaging 50,000 tons per billion dollars of real GNP. This reduced consumption ratio has been linked to the increase in paper and paperboard prices during 1973 to 1974. During periods of economic downturns, this vertically integrated industry shifts its focus from domestic to foreign markets, which have been strong in recent years.[131]

As a percentage of packaging discards, paper remained stable from 1960 (49.3%) to 1980 (49.4%) and is projected to increase to 51% in 1990. Within paper packaging constituents, however, the percentage of discards shifted considerably, as noted in Table I-D-7.

The corrugated box is the main form of packaging (90-95%) for goods in the U.S. and additional user applications are expected due to trends in use for retail display, as well as shipping.

Corrugated increased steadily as a percentage of all paper/paperboard packaging discards. Corrugated consumption has historically grown at rates well in excess of real GNP. It is expected to continue to be one of the fastest growing grades of paper, although at a rate nearer to the real GNP[130]. There will also be an increased use of corrugated boxes in combination with plastics,[131] during the 1980s, however, and this change in corrugated constituency will pose processing problems when marketing corrugated for recycling.

TABLE I-D-6(b)[145]

ESTIMATED VOLUME OF SOFT DRINK PACKAGED IN FAMILY-SIZE CONTAINERS*

Year	Volume Packaged in Each Container Type (million gallons)		
	Nonrefillable Glass	Plastic-Coated Glass	PET
1974	57	86	0
1975	69	161	0
1976	83	334	0
1977	50	455	90
1978	30	563	116

* Gallonage represents only that soft drink which is packaged in containers 48-fluid-ounces or larger.

TABLE I-D-7[181]

CONSTITUENCY OF PAPER/PAPERBOARD CONTAINERS AND PACKAGING
(as % of Paper Packaging)

	1960	1970	1980	1990
Corrugated	54	61	64	67
Other Paperboard	25	21	20	18
Paper Packaging	21	18	16	15

Containerboard and printing and writing papers are the two largest grades in the paper industry. Printing and writing papers have also grown historically at rates well in excess of the real GNP. They will also continue to grow faster than other paper industry grades but, like containerboard, will grow instead at a rate close to the real GNP.[130]

Overall paper consumption is forecast to grow at a rate of 2.2% annually through the 1990s. In contrast, printing, writing and containerboard production are forecast to grow annually at the higher rates of 2.9%, 3.3% and 2.8% respectively.[130]

Competition from electronic media is expected to have little or no effect on paper demand before 1990. Newspapers are expected to be the first paper category to face stiff competition from the electronic media, but this is not expected to occur until the late 1980s or early 1990s. Newsprint demand is expected to grow at a 2% to 3% rate in the 1980s.[193]

Energy costs are increasing for the industry. Paper mills (excluding building paper or paperboard mills) are the fourth largest ranking portion of the industry in terms of energy costs relative to value of shipments. However, the impact of energy costs is softened because overall, the paper and pulp industries generate about 45% of their energy needs internally. Energy requirements are the highest for pulping segments of the industry, but their potential for internally generated energy is also the highest (burning bark and pulping liquors and recovery of process heat). Industry has made substantial progress in fossil fuel conservation, and alternative non-fossil fuels will become more commonplace in the eighties.[131]

2. Glass

Glass as a percentage of gross discards in municipal solid waste has increased from 7.3% by weight in 1960, to 9.4% in 1970, to 10.3% in 1980. It is projected to drop slightly in 1990 to 9.6%.[181]

This change in percentage of gross discards is directly related to the glass industry's ability to compete in its major market area, glass containers. Glass containers constitute over 92% of all glass discards in municipal solid waste (compared to 70% of total glass tonnage output[183]) due to their short life-span compared to miscellaneous glass durable products. Most (65% or more) container glass produced in the U.S is flint (clear). This percentage is expected to remain fairly constant in 1990. The other two major segments of the glass industry, flat gloss and pressed and blown glass, constitute less than 8% of post consumer waste.[183]

Market Prospects

Prospects for the glass container industry, the market with the highest impact on municipal solid waste, have been discussed in Section E, Packaging.

Technical advances in glass container melting, forming and production processes are directly linked to the industry's ability to compete in the packaging field against metal and plastic as discussed in the packaging section. Industry efforts include reducing energy and labor costs, developing more efficient production processes, and increasing bottle strength and lightness to reduce transportation costs.[131]

Economic Factors/Legal Compliance

As pointed out in the packaging section, the glass container industry is experiencing strong competition from metal cans and plastic bottles in its primary container market, the beverage industry. Economic factors have thus become more important in the effort to make the glass container price competitive in the marketplace. The industry has made great efforts in recent years to reduce overall production costs and especially energy costs. Another area of economics is the high cost of meeting governmental particulate emission standards. Part II of this report discusses how the industry increasingly views recycling of post-consumer cullet as a way to help solve industry energy and cost problems.

The potential for saving costs in the glass container industry is greatly enhanced by industry structure, since the industry both makes the melted glass and uses the direct flow of melted glass from the furnace as it streams onto feeders and glass blowing machines.[131]

Total Change

Over a 20 year period, from 1960 to 1980, glass gross discards increased nationwide from 7.3% of municipal solid waste (6,522 tons) to 10.3% in 1980 (15,000 tons). Growth has slowed in recent years and glass is expected to decline to 9.6% (16,500 tons) of gross discards nationwide in 1990. State container legislation directly affects local

glass composition by decreasing metal cans, increasing returnables and removing glass containers from the waste stream through store deposits and high return rates. The same is true for localities with active public buy-back programs operated by industry.

3. Ferrous Metals

Growth in Waste Stream

In 1979 the U.S. produced 135 million tons of raw steel and had net imports of 13.6 million tons, a total of 148.6 million tons. About 45% of this steel (about 71 million tons) is readily recoverable for recycling with existing technology and at reasonable prices. In 1979 81% of the readily recoverable scrap was recovered for domestic use and export. Our 700 million ton "inventory" of recoverable ferrous scrap increased by 13 million tons.

Ferrous containers represent only 1/2 percent of recoverable scrap but 75% of the ferrous in our waste stream. The volume of ferrous containers shipped to market has declined by 9% in the last 5 years having lost market share to aluminum containers. Ferrous containers in waste has had a negative growth in the decade of the 1970s.

Personnel Factors

Overall metal container shipments from 1975-1979 increased at a rate roughly equal to population growth. All of the new market was absorbed by aluminum containers which increased shipments from 22,083 million cans in 1975 to 34,735 million cans in 1979.

New Technology

The steel container industry anticipates an end to their continuing market share erosion with the introduction in 1982 of the tin-free lightweight seamless can. The industry expects that this new type of can will compete successfully with aluminum in cost of production, weight of container and shelf-life.

Legal Compliance

Container legislation requiring deposits on all beverage containers ("Bottling Bill") has had a negative impact on ferrous containers. While many glass containers can be reused, steel containers cannot. Therefore, metal containers are at a competitive disadvantage to glass beverage containers in the states that have such legislation.

"The most consistent effect of deposit laws is a substantial decrease in market share for cans in the overall package mix."[158]

According to Beverage Industry, a trade journal, in the following states which have bottle bill legislation, use of cans for beer packaging went from 33% in 1971, to 8% in 1978 in Oregon, from 39% in 1970 to 28% in 1978 in Vermont and from 38% in 1977 to 29% in 1978 in Maine. The bottling industry believes that certain regions will resist such legislation; the South and the central western region seem most resistant to legislation, while the Northeast and the West Coast states seem quite willing to enact the legislation.

Market Prospects

Steel based containers will continue to lose market share to aluminum cans through 1990.

Impact of Industry - Volume and Composition

In order to compete with the aluminum industry, steel can manufacturers plan the introduction of lightweight, seamless two piece cans. Ferrous content of refuse should increase moderately from 7.5% of post-consumer waste (PCW) nationwide in 1980 to approximately 7.8% by 1990. The impact of the new containers will be regional. Areas which traditionally have favored aluminum cans, the South and the West Coast may experience a greater than average change in the ratio of aluminum to ferrous cans. Now, small "mini mills" located in the South and the West Coast will be producing lightweight steel can stock to an increasing degree in the eighties.

Economic Factors

The relatively lower cost of steel can production versus aluminum production would favor steel cans. However, the cost of shipping the relatively heavier steel can stock outweighs production cost differences. Areas of the nation located near aluminum production facilities tend toward greater use of aluminum cans; conversely, steel cans are more popular in areas located near steel production facilities.

Total Change

On a average material basis the volume of steel cans in PCW should decrease slightly through 1984 and then increase slightly to 1990. The ferrous can component in the 1980s should decrease to about 7.4% of PCW and end the decade at about 7.8%.

4. Non-Ferrous Metals - Aluminum

Aluminum use exceeds that of any primary metal, with the exception of steel, due to its characteristics of corrosion resistance, high strength-to-weight ratio, good electrical and thermal conductivity, and good malleability, as well as the fact that the metal and many of its alloys may be formed or cast easily. The average annual growth rate of

the aluminum industry since 1946 has been 8%, and with a per capita use of 65 pounds per person in 1978 (47.2 pounds per person in 1968), the United States continues to be the largest worldwide consumer of aluminum.[101]

The three largest end-use categories for aluminum over the past ten years have been building and construction, containers, and packaging and transportation. Of these three top end-use categories, containers and packaging, with their relatively short life span, have the largest impact on the aluminum content of municipal solid waste. The aluminum in municipal solid waste consists primarily of beverage cans, the remainder being miscellaneous foil, extrusions, and castings. Aluminum's inroads into the container market over the past ten years is discussed more fully in the section on packaging.

Today municipal solid waste contains approximately one percent aluminum and this is expected to rise to about 1.13% in 1990. The overall industry growth rate however is expected to slow to a 4-6% average annual expansion in the latter part of the decade. Predictions have been made that expansion of aluminum supplies over the next five years will come too slowly to keep up with the growth in world demand, and prices will rise steadily because of high energy costs. One major reason given for the predicted supply pinch is that new smelting capacity was not built during the early 70s. New smelting capacities are expected to accelerate in the 80s in areas outside the U.S. and Europe where energy is relatively expensive and bauxite plentiful.[171d]

Due to the energy intensive nature of primary aluminum production, the industry has been strongly affected by the increasing cost of energy and has sought ways to reduce energy consumption through improved production technology. In 1940, the industry-average energy requirement to produce one pound of primary aluminum was 12 kWh. Today the industry average is 8 kWh per pound, with the newer and more efficient plants utilizing 6 kWh.[131/87T] A pilot commercial plant utilizing a new process is reported it be utilizing 4.5 kWh per pound of aluminum production.[87T]

Other Non-Ferrous Metals

The balance of the non-ferrous fraction of gross discards consists primarily of copper, brass, zinc, lead and non-magnetic stainless steel. This combined portion has remained fairly stable since 1960, when it represented only 0.24% of all gross discards to the present, when it is estimated at 0.3%. This percentage is expected to remain constant through 1990.

5. Plastics

As a percentage of gross discards, plastics have grown from .38% of the waste stream in 1960 to 2.57% in 1970 and 4.17 in 1980. By 1990

TABLE I-D-8

ALUMINUM SCRAP CONSUMPTION AND RECOVERY*
1946-1979

SHORT TONS

Year	SCRAP CONSUMPTION: Total Industry(1)	SCRAP CONSUMPTION (GROSS WEIGHT BASIS) AS REPORTED: Total	Secondary Smelters	Primary Producers(2) (3)	Others(4)	RECOVERY (5) (RECOVERED METAL BASIS): Total Industry(1)	From New Scrap	From Old Scrap
1946	344,000	344,000	238,000	100,000	6,000	278,073	187,538	90,535
1950	273,192	273,192	192,047	68,316	12,829	243,666	167,308	76,358
1955	490,000	427,045	313,879	86,739	26,427	414,000	314,500	99,500
1960	523,000	441,479	353,889	54,366	33,224	438,000	343,000	95,000
1965	970,000	816,620	579,844	94,985	141,791	829,000	624,000	205,000
1970	1,167,000	972,533	650,327	153,247	168,959	1,000,000	803,000	197,000
1975	1,454,000r	1,232,155	611,540	342,810	277,805	1,236,000	899,000	337,000
1979	2,020,000	1,705,031	922,159	442,262	340,610	177,000	1,163,000	614,000

r - revised
p - preliminary
(1) As reported, 1946-54; estimates expanded from reported figures, 1955-78.
(2) For 1951-53 includes small amounts reported consumed by non-integrated fabricators.
(3) Represents 100 per cent scrap consumption coverage by primary producers.
(4) Most consumption of sweated pig apparently not reported by "others" prior to 1961.
(5) Recovery from sweated pig included in new scrap 1946-60, old scrap 1961-78.

SOURCE: U.S. Department of the Interior, Bureau of Mines and U.S. Department of Commerce, Bureau of Industrial Economics, Office of Basic Industries

* Aluminum Statistical Review 1978, The Aluminum Association Inc. (updated by Aluminum Association staff).

they are expected to account for 6% of gross discards in municipal solid waste.[181]

Packaging is the single largest market for plastics resin, accounting for one out of every four pounds consumed. in 1979, 10,334 million pounds of resin were distributed to the packaging market, up 14% from 1978. The second largest market is building and construction, with 19.6% of the market, folowed by consumer institutional use with 9.7% of the plastics market.[175] Table I-D-9 reviews the plastics industry's major markets from 1975 through 1979.

Approximately 80% of all plastics produced are "theromplastics," or those which may be remelted and reformed. "Thermosetting plastics" are those which, in contrast, "set" after they have been formed and cannot be remelted. Only 20% of plastic production falls into this category. Table I-D-10 shows projected thermoplastic markets by 1990.

The three largest markets for thermoplastics during the 1980s will continue to be packaging, construction and household. Other dominant markets will include consumer and transportation, as cars contain increasing percentages of plastic to reduce weight and conserve fuel.[188b]

Packaging's importance as a major plastics market is discussed in detail in the packaging section of this report. However, further review of plastic gross discards data reflects the impact of this "short life" market on the waste stream. While only 31% of all plastic discards were packaging items in 1960, by 1980 this percentage had grown to 64% and it is projected to grow to 69% by 1990.[181] Thus plastic packaging, like other packaging materials, has an even greater impact on the waste stream than its impressive market share would at first indicate.

Technology and energy/cost/price factors are closely interwoven in the plastics industry and technological advances within the industry have played a major role in making plastics competitive with other materials despite the increasing costs of crude oil and natural gas, both plastic feedstocks. Composites of plastics and non-plastics help compensate for increases in feedstock prices and often actually increase total potential markets by volume.

Volume-resin prices increased by an average of 50% from mid-1978 to mid-1980. According to a recent industry publication the price increases are more than counterbalanced by a new generation of resins that yield more usable product per pound, flow faster and upgrade toughness and as a result are more cost-effective.[188a] In fact, research and development expenditures are estimated to be almost 4% of industry sales, leading to energy savings and other production costs as well as improvements in product quality. One major example is a new process developed by Union Carbide for the production of LDPE, the most common plastic made (see Table I-D-10). The process cuts energy uses by 25%, capital investment requirements by 50%, will improve plant safety and

TABLE I-D-9
PLASTICS INDUSTRY[175]

COMPARATIVE PERCENTAGE DISTRIBUTION BY MAJOR MARKET

MAJOR MARKET	1975	1976	1977	1978	1979
Transportation	5.7%	6.5%	6.1%	5.7%	5.0%
Packaging	25.4	26.6	25.4	25.8	26.7
Building/Construction	17.0	16.5	19.3	19.8	19.6
Electrical/Electronic	8.1	9.1	8.9	8.4	7.9
Furniture/Furnishings	6.2	5.9	4.5	4.8	4.9
Consumer/Institutional	13.1	10.1	10.4	10.3	9.7
Industrial/Machinery	1.4	1.2	1.5	1.1	1.3
Adhesives/Inks/Coatings	8.8	8.4	8.2	8.3	7.2
All Other	8.1	7.8	8.8	8.4	8.9
Exports	6.2	7.8	6.9	7.4	8.8
Total	100.0%	100.0%	100.0%	100.0%	100.0%

* Note: All figures exclude polyurethane.

TABLE I-D-10
PROJECTED GROWTH THROUGH 1990 [188b]
OF THERMOPLASTIC RESINS AND THEIR MARKETS

Consumption

	(million lb)		Annual Growth, %	
	1978	1990	Historic	Projected
RESIN				
LDPE	7,130	15,050	9.5	6.4
PVC	5,760	15,550	9.5	8.6
HDPE	4,150	11,840	14.2	9.1
Polystyrene	3,850	10,530	8.6	8.7
Polypropylene	3,075	10,175	18.7	10.5
ABS & SAN	1,260	3,065	9.8	7.7
Acrylics	945	2,000	9.5	6.4
Cellulosics	465	400	-1.9	-1.3
Nylon	275	675	11.4	7.8
Other styrenics and vinyls	1,690	2,850	7.5	4.4
Other thermoplastics	760	2,250	13.5	9.5
Total	29,360	74,385	Avg. 10.0	8.1
MARKET				
Packaging	8,375	20,925	10.3	7.9
Construction	5,830	15,270	12.3	8.3
Household	4,210	11,180	13.2	8.5
Consumer	1,980	4,774	8.2	7.6
Transportation	1,125	2,805	13.8	7.9
Textile	970	2,380	21.3	7.8
Agriculture	620	1,650	18.1	8.5
Other	4,055	11,420	4.9	9.0
Exports	2,195	3,990	8.4	5.1
Total	29,360	74,385	Avg. 10.0	8.1

pollution control and cut the need for production space by 90% by the mid-eighties.[131]

Added to these factors is the relative energy impact of manufacture and use of plastics as compared to alternative materials. Studies have shown that although plastics utilize energy sources as material feedstocks, in many cases the total energy required to manufacture plastics products can be lower than that required to manufacture non-plastic alternatives. Measurements of energy consumption can take into consideration the energy required to process raw materials, the amount of energy resources in the raw materials themselves and the amount of energy consumed in a product's shipment and service life. Combining all these energy factors can make plastics very competitive with other materials in some markets.[145] PET 2-liter soft drink containers, discussed in the packaging section, are a good example of an energy efficient, cost-effective plastic product.

Even with energy conservation measures, the plastics industry is bracing for permanent raw-material supply shortages and the resulting short and long-term continued rise in resin price levels. Resin shortages are not expected, due to increased capacity expansions by resin suppliers. But material conservation measures will increase, with continuing moves toward lighter disposables and changes in production technology to produce longer-life durables.[188d]

These measures, and plastics' many advantages over other materials (high strength to weight ratio, freedom of design, ease of fabrication), will contribute to plastics' continued growth in the eighties.

Thermoplastic resins are expected to be the fastest growing materials used in the United States throughout the 1980s, with an expected annual growth of 8% and consumption of thermoplastics alone over 74 billion pounds in 1990. Construction and household markets will continue to be the 3 largest markets,[188b] and projected gross discards for plastics will grow from today's 4.17% of total municipal solid waste to 6% in 1990.[181]

6. Other Waste Categories

Rubber, leather, textiles and wood, as a percentage of total gross discards nationally, have remained fairly constant from 1960 to 1980 and this is expected to be true also for 1990. (As a percentage of packaging discards, however, wood has substantially decreased and this trend is expected to continue through 1990).[181]

Food and yard wastes, however, have shown a steady decline since 1960. This trend is also expected to continue.[181] Table I-D-11 shows the trends for these categories from 1960 to 1990.

TABLE I-D-11

OTHER NON-FOOD PRODUCT WASTES
(as % of Total Gross Discards)

	Rubber/ Leather	Textiles	Wood
1960	2.06	2.38	3.14
1970	2.47	2.37	3.0
1980	2.45	2.3	3.17
1990	2.4	2.4	3.5

NON-PRODUCT WASTES
(as % of Total Gross Discards)

	Total Non-Product Wastes	Food Wastes	Yard Wastes	Misc. Inorganic Wastes
1960	43.09	20.0	21.73	1.36
1970	36.06	16.56	18.02	1.38
1980	33.80	15.15	17.25	1.40
1990	32.61	13.99	15.92	2.70

7. Correlation to the Navy

Total Waste

The best statistical developments of solid waste generation rates[181] are based on national data. Analysis of trends in a selected sector will be most accurate using these data. Using national statistics as a basis for predicting the volume and constitutency of the Navy waste stream requires the use of several assumptions. Such assumptions will each be defined and justified below.

Projection of the gross annual volume of waste is computed based on a per capita/day figure and a population figure. On a national basis these numbers are both increasing and the figures cited earlier in this report can be reduced to the following:

POPULATION BASIS FOR EPA PROJECTIONS[181]
(Millions)

1970	1975	1977	1980	1985	1990
205.1	214.0	216.0	221.8	232.3	244

CORRESPONDING ANNUAL PERCENTAGE INCREASES

1970-75	1975-77	1977-80	1980-85	1985-90
4.3%	.9%	2.7%	4.7%	5.0%

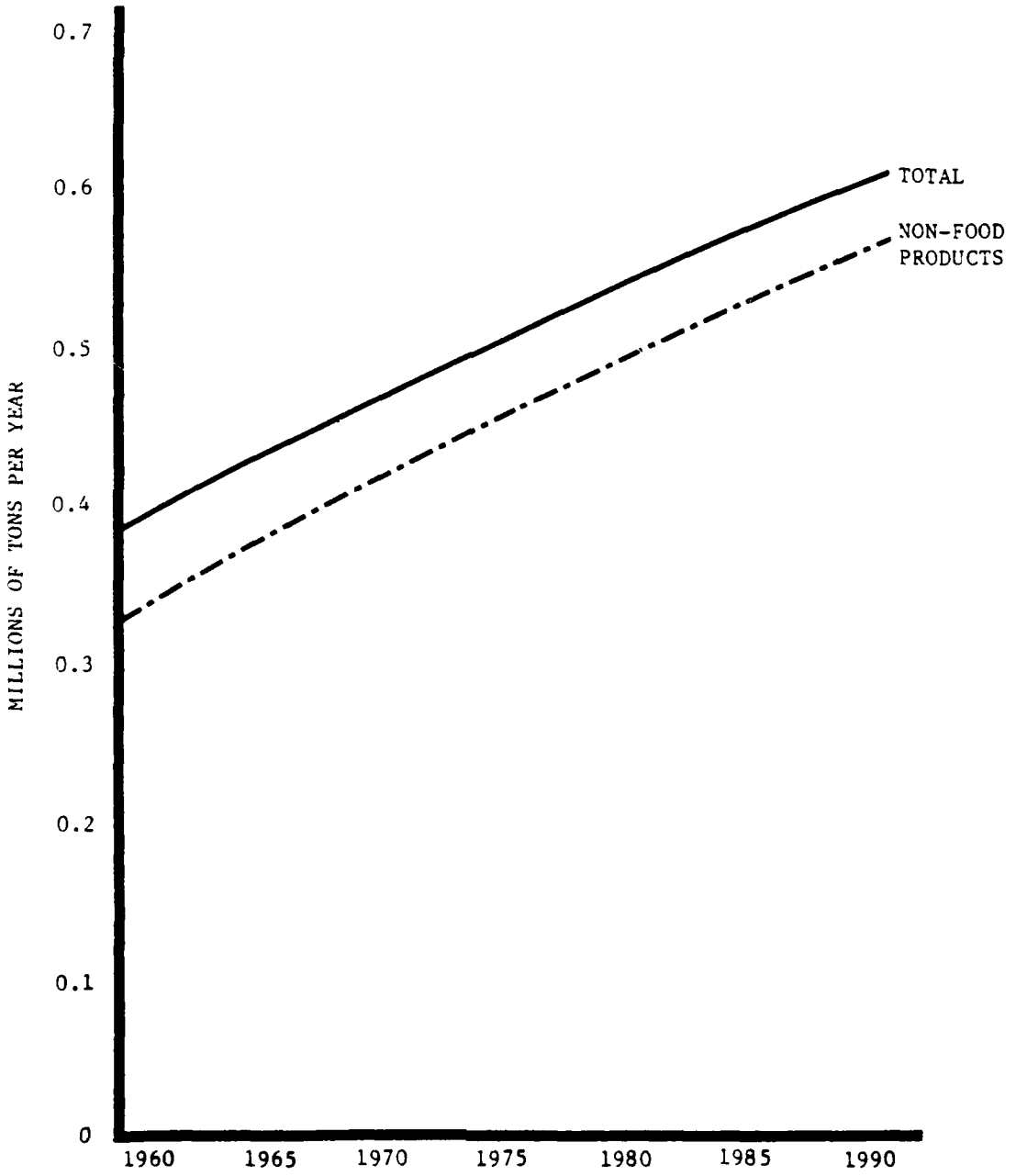
WASTE GENERATION PER CAPITA/DAY (lbs)

1970	1975	1977	1980	1985	1990
3.5	3.7	3.7	3.8	4.0	4.2

CORRESPONDING ANNUAL PERCENTAGE INCREASES

1970-75	1975-77	1977-80	1980-85	1990-95
5.7%	0%	2.7%	5.2%	5%

FIGURE I-D-4
NAVY
POST CONSUMER SOLID WASTE



GROSS TONNAGE OF WASTE
(Thousands)

1970	1975	1977	1980	1985	1990
131	143	146	161	170	187

CORRESPONDING PERCENT INCREASES

1970-75	1975-77	1977-80	1980-85	1985-90
9.2%	2.1%	2.7%	5.6%	10%

These numbers represent the changes in individual consumption of goods based on cultural, technological and economic trends and, of course, increasing population.

To apply these directly to the Navy represents a slight exageration in the increase in total waste due to the high percentage of office waste to be found in its waste stream. Paper items in the detailed projection of gross discards as represented in Table I-D-12 show proportionate increases in paper which couldn't occur in the Navy waste stream because of the already dominant position of paper. Interpretation of these factors is too complex to resolve accurately. For this reason the projections made here will accept the national numbers as a close approximation index.

The increasing size of the population as shown above contributes significantly to the size of the national waste stream and this factor carries over in a similar fashion to the DOD activities. The Department of Labor[181] (see Table I-D-13) projects a constant level for military personnel but an increasing civilian level through the year 1990. An extension of this projection is to assume that the Navy will remain at roughly its present manpower levels militarily and expand as below in the civilian sector.

BASE CIVILIAN DOD MANPOWER LEVELS IN THOUSANDS

1977	1980	1985	1990
2120	2152	2226	2300

CORRESPONDING PERCENT INCREASE

1977-80	1980-85	1985-90
1.5%	3.4%	3.3%

Using the civilian to military mix ratio from section I-A-5 of 0.74:1 and applying it to the Navy population from that section the following numbers are derived:

TABLE I-D-12

PERCENT INCREASE (DECREASE) IN CONSTITUENCY
ON A NATIONAL BASIS

	1977-1980	1980-1985	1985-1990
Paper	2%	2.3%	0.8%
Glass	7.3%	(6.8%)	0
Metal	(3.1%)	(2.8%)	0
Plastic/Rubber	10%	13.6%	12%
Other	(3.9%)	(1.9%)	(.5%)

The constituency breakdowns at North Island, California were:

Paper	89%
Glass	0.16%
Metal	1%
Plastic/Rubber	0.5%
Other	9.4%

Following the trends shown in Table I-D-13 to these proportions will yield roughly the following breakdown:

Paper	89%	89.5%	90%	90%
Glass	0.16%	0.18%	0.16%	0.16%
Metal	1.0%	1.0%	1.0%	1.0%
Plastic/Rubber	0.5%	0.6%	0.6%	0.7%
Other	9.4%	9%	8.5%	8.5%

Applying these percentages to overall tonnage generated by the Navy yields the following:

	TONS/DAY		
	1980	1985	1990
Paper	1336.2	1432.8	1526.4
Glass	2.7	2.5	2.7
Metal	14.9	15.9	17.0
Plastic/Rubber	9.0	9.6	11.9
Other	134.4	135.3	144.2
Totals	1493	1592	1696

1980: Civilian - 281,974
Military - 380,233

Total - 662,207

1985: Civilian - 281,974 x 1.034 = 291,561
Military - 380,233

Total - 671,794

1990: Civilian - 291,561 x 1.033 = 301,182
Military - 380,233

Total - 681,415

An extrapolation of the baseline total waste figure from section I-A-5 yields the following:

1980: 4.51 lb/person/day

1985: 1.052* x 4.51 lb/person/day = 4.74 lb/person/day

1990: 1.05* x 4.74 lb/person/day = 4.98 lb/person/day

* See percentage increase tabulated previously on a national basis.

The combination of both population and per capita generation data yield the following gross tonnage production:

1980: 662,209 persons x 4.51 lb/person/day ÷ 2000 lb/ton = 1493 TPD

1985: 671,794 persons x 4.74 lb/person/day ÷ 2000 lb/ton = 1592 TPD

TABLE I-D-13

LABOR FORCE, EMPLOYMENT, PRODUCTIVITY, AND GROSS NATIONAL PRODUCT, 1955, 1968, 1973, AND 1977, AND PROJECTED TO 1980, 1985, AND 1990

(Employment data in thousands)

Component	Actual				Projected					
					Base			High employment		
	1955	1968	1973	1977	1980	1985	1990	1980	1985	1990
Total labor force (including military)	68,072	82,272	91,040	99,534	106,099	115,041	121,456	107,554	119,095	127,692
Unemployed	2,853	2,817	4,305	6,855	5,721	5,309	5,371	5,901	6,680	5,024
Employed (persons concept)	65,219	79,455	86,735	92,679	100,378	109,732	116,085	101,653	114,415	122,668
Adjustment factor (persons to jobs)	3,416	4,364	4,557	3,501	3,973	4,708	5,119	4,080	5,222	5,732
Employment (jobs concept)	68,657	83,864	91,292	96,180	104,351	114,440	121,204	105,833	119,637	128,405
General government	9,520	14,522	15,185	16,143	16,755	17,567	18,066	17,941	19,994	19,902
Federal	4,779	5,670	4,354	4,253	4,241	4,315	4,389	4,241	4,315	4,389
Military	3,049	3,535	2,326	2,133	2,089	2,089	2,089	2,089	2,089	2,089
Civilian	1,730	2,135	2,028	2,120	2,152	2,226	2,300	2,152	2,226	2,300
State and local	4,741	8,851	10,831	11,890	12,514	13,252	13,677	13,700	15,679	15,513
Education	2,180	4,798	5,916	6,491	6,579	6,679	6,513	6,579	6,679	6,513
Noneducation	2,561	4,053	4,915	5,399	5,935	6,553	7,164	7,121	9,000	9,000
Private	59,137	69,343	76,107	80,037	87,596	96,893	103,138	87,892	99,633	108,498
Agriculture	6,424	3,663	3,206	2,922	2,974	2,922	2,634	2,974	2,922	2,634
Nonagriculture	52,713	65,680	72,901	77,115	84,622	93,971	100,504	84,918	96,711	105,864
Private average annual hours per job	2,126	2,002	1,961	1,918	1,900	1,867	1,839	1,906	1,866	1,847
Agriculture	2,473	2,354	2,290	2,306	2,235	2,180	2,126	2,235	2,180	2,126
Nonagriculture	2,083	1,981	1,943	1,903	1,888	1,858	1,832	1,888	1,859	1,833
Private GNP per hour (1972 dollars)	4.54	6.63	7.34	7.72	8.15	9.07	10.24	8.17	8.98	10.08
Agriculture	1.84	3.41	4.40	5.11	5.73	6.67	8.08	5.71	6.61	8.07
Nonagriculture	4.93	6.85	7.49	7.84	8.25	9.16	10.31	8.26	9.07	10.14
Total GNP (billions of 1972 dollars)	654.7	1,055.8	1,335.0	1,332.6	1,511.2	1,803.3	2,112.8	1,526.4	1,853.1	2,196.2
General government	84.3	131.7	138.9	147.1	154.3	162.8	169.4	162.8	180.3	182.6
Private	570.2	920.1	1,196.1	1,185.5	1,356.9	1,640.6	1,943.4	1,363.7	1,672.8	2,013.6
Agriculture	29.2	29.4	32.3	34.4	38.1	42.5	45.3	37.9	42.4	45.2
Nonagriculture	541.2	890.7	1,063.8	1,151.1	1,318.8	1,598.0	1,898.2	1,325.7	1,630.5	1,968.4

	Average annual rate of change								
	1955-68	1968-73	1973-77	1977-80	1980-85	1985-90	1977-80	1980-85	1985-90
Total labor force (including military)	1.5	2.0	2.3	2.1	1.6	1.1	2.6	2.1	1.4
Unemployed	-.2	8.3	13.0	-5.8	-1.5	-.2	-5.4	-2.1	-1.4
Employed (persons concept)	1.5	1.8	2.2	2.7	1.8	1.1	3.2	2.6	1.4
Adjustment factor (persons to jobs)	1.9	.7	-6.4	4.3	3.5	1.7	5.2	5.0	1.9
Employment (jobs concept)	1.5	1.7	1.3	2.8	1.9	1.2	3.2	2.5	1.4
General government	3.3	.9	1.5	1.2	.9	.6	3.6	2.2	-.1
Federal	1.3	-5.1	-.6	-.1	.3	.3	-.1	.3	.3
Military	1.4	-8.0	-2.1	-.7	0	0	-.7	0	0
Civilian	1.6	-1.0	1.1	.5	.7	.7	.5	.7	.7
State and local	4.9	4.1	2.4	1.7	1.1	.7	4.8	2.7	-.2
Education	6.3	4.3	2.3	.4	.3	-.5	.4	.3	-.5
Noneducation	3.6	3.9	2.4	3.2	2.0	1.8	9.7	1.8	0
Private	1.2	1.9	1.3	3.1	2.0	1.3	3.2	2.5	1.7
Agriculture	-4.2	-2.6	-2.3	.6	-.4	-2.1	.6	-.4	-2.1
Nonagriculture	1.7	2.1	1.4	3.2	2.2	1.4	3.3	2.6	1.8
Private average annual hours per job	-.5	-.4	-.6	-.3	-.3	-.3	-.3	-.3	-.3
Agriculture	-.4	-.6	.2	-1.0	-.5	-.5	-1.0	-.5	-.5
Nonagriculture	-.4	-.4	-.5	-.3	-.3	-.3	-.3	-.3	-.3
Private GNP per hour (1972 dollars)	3.0	2.1	1.3	1.8	2.2	2.5	1.9	1.9	2.3
Agriculture	4.9	5.2	3.8	3.9	3.1	3.8	3.8	3.1	3.9
Nonagriculture	2.6	1.9	1.1	1.7	2.1	2.4	1.8	1.9	2.3
Total GNP (billions of 1972 dollars)	3.7	3.3	1.9	4.3	3.6	3.2	4.6	4.0	3.5
General government	3.5	1.1	1.5	1.6	1.1	.8	3.4	2.1	1.9
Private	3.7	3.6	2.0	4.6	3.9	3.4	4.8	4.2	3.8
Agriculture	1.1	1.9	1.6	3.2	2.2	1.2	3.4	2.3	1.3
Nonagriculture	3.9	3.6	2.0	4.6	3.9	3.5	4.8	4.2	3.8

SOURCE: Actual data on employment and labor force Bureau of Labor Statistics. Actual GNP data: Bureau of Economic Analysis, U.S. Department of Commerce Projected data Office of Economic Growth, BLS

Source: US Department of Labor, Bulletin 2030, Employment Projections for the 1980s

1990: 681,415 persons x 4.98 lb/person/day ÷ 2000 lb/ton = 1696 TPD

Constituency

In this study quantification of the constituent data in tons will require the acceptance of the numbers derived from the work done at North Island, California as a representation of the entire Navy. While this is not a well founded assumption, the exercise will serve as an example of how numbers from a broader data base such as the NFA files at FACSO can be treated.

E. FACTORS IN PACKAGING - MATERIAL AND COST

1. Constituents: Current and Trends

While several identifiable changes in packaging constituents have taken place since 1960, identifying strong trends from 1980 to 1990 is difficult for some constituents for several reasons.

First, packaging as a percentage of gross discards is projected to increase by less than one percent by 1990.[181] In large part this is due to a steady trend toward lighter containers, through either material substitution (aluminum for steel, plastic for glass) technological advances in product manufacture, and a trend toward larger size containers for soft drinks and food.[131]

Competition among packaging materials is growing more intense in this period of slow overall packaging growth, due to limited growth applications in some markets, the increasing cost of energy, cost/price imbalances, increasing governmental regulations and cost of compliance, and the manner in which consumer, safety, environmental and energy issues bear on industry planning and decision making.[131]

Thus changes in constituency will take place primarily at the expense of other packaging products, and in some cases the competition is so intense and factors so complex that industry analysts are still not sure of the outcome. This is particularly true in the beverage industry, where aluminum and steel can rivalry in the soft drink market, for example, is intense, and energy and cost/price factors will play a major role in determining marketplace gains in the 80s. Continued technological advances and cost savings practices within the packaging industries, combined with many extraneous factors, shift balances in this competitive environment from year to year.

Energy considerations will prompt industry to use energy economically in the raw material and product manufacturing processes. In addition, energy concerns will also lead to some trends toward product standardization in order to assist in product recycling.[177]

A contrasting trend in packaging constituents will inhibit recycling. Increasingly, packaging in the 80s will lead toward hybrid packaging in order to wring top performance out of packaging at minimal cost. The plastic coated bottle, flexible can, plasticized corrugated carton and paper shopping bags are examples of this trend toward combinations of materials in one package, each of which performs a function for which it is best suited.[177]

Glass

Glass containers currently represent 28.8% of all packaging gross discards, as opposed to 24.3% in 1960.[160] Shipments grew rapidly from the mid-sixties to the mid-seventies, because of both the rapid growth of the beverage industry and the corresponding increase in non-refillable containers. Competition from metal cans, primarily aluminum, throughout the 70s and the phenomenal growth of two-liter plastic soft drink bottles in the late 70s had considerable negative impact on the glass industry.[131] Nevertheless, industry and government analysts expect glass containers to become more competitive with cans and plastic in the 80s, slowing the general decline of glass containers in the face of metal and plastic competition. Among the factors pointing to some resurgence of glass in the early 80s are: 1) aggressive promotion of glass as a cost-effective container; 2) recent dramatic inroads in brewer use of non-returnable and returnable beer bottles; and 3) the increase of single service glass bottles (7-10-16 oz.) where plastic polyethylene terephthalate (PET) is not price competitive.[174] Glass industry sources feel confident that glass can hold its own and make inroads in new glass markets, and industry and government analysts predict a 2-3% annual growth rate for glass.[174, 131]

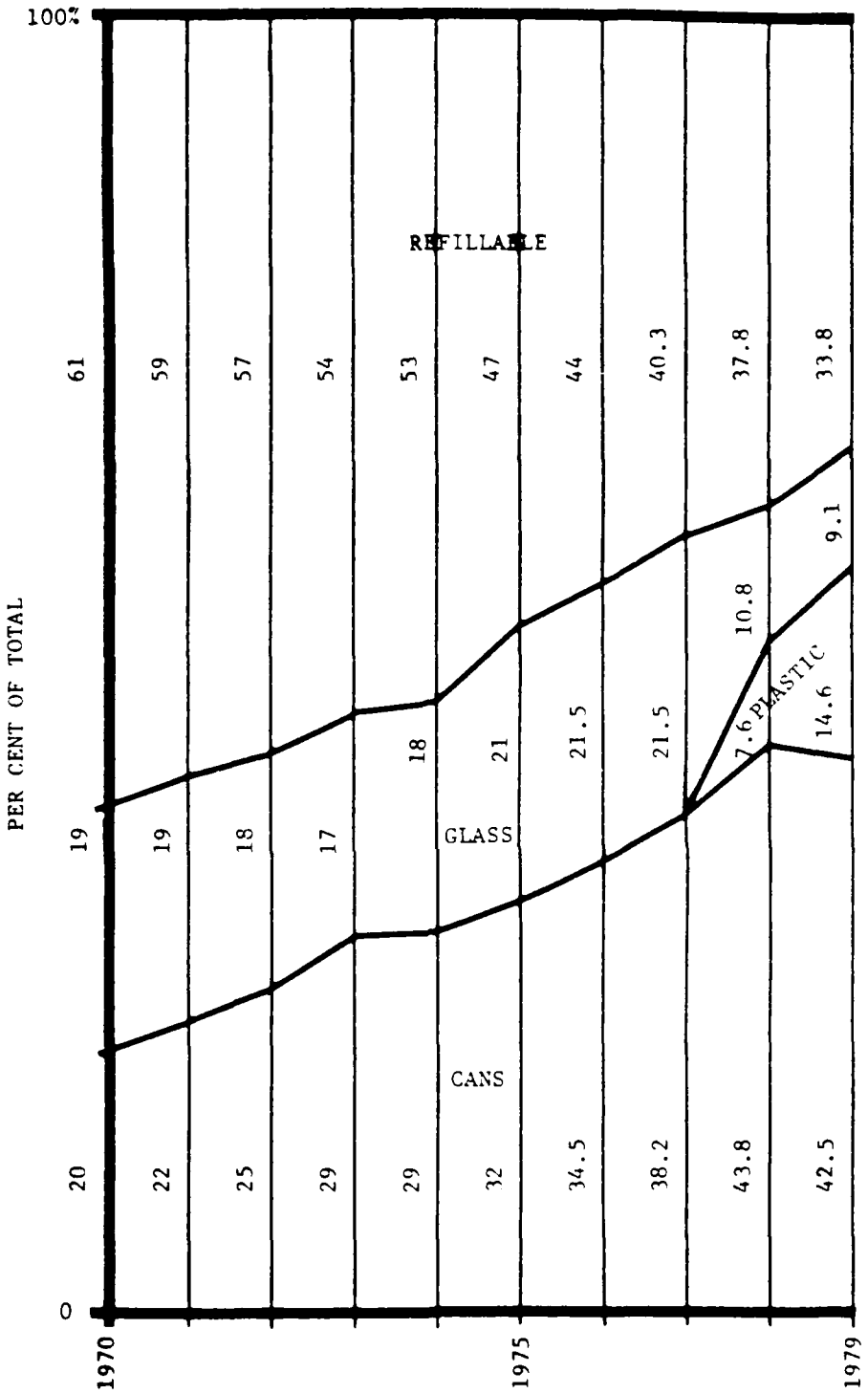
Glass containers are projected to be 26% of total gross packaging discards in 1990.[181]

As Figure I-E-1 indicates, glass lost ground during the 70s in the soft drink market but increased in the beer market.[102] Returnables in the beer market, as a result of mandatory deposit laws, showed a 72.3% increase during the first 10 months of 1979. This trend is expected to increase if state container legislation increases in the eighties.[174]

Cans

Steel cans currently represent 8.3% of total packaging gross discards, vs. aluminum's 2.2% of total packaging gross discards. When compared with 17.4% for steel and 0.6% for aluminum in 1960 and 13% for steel and 1.3% for aluminum in 1970, a marked trend for aluminum cans replacing steel is noted.[181] This displacement is due to major aluminum can inroads in the beverage industry. Steel maintains a 61% share of all cans shipped in 1979, a 97% share of food cans shipped and a 99% of general (non-food, non-beverage) packaging. In the beverage

FIGURE I-E-1



SOFT DRINK PACKAGE DISTRIBUTION
BY YEAR

Source: National Soft Drink Association, 1980.

TABLE I-E-1

METAL CAN SHIPMENTS - 1979
(Million Cans)

	TOTAL CANS	BY MATERIAL		BY TECHNOLOGY	
		Steel	Aluminum	2-Piece	3-Piece
TOTAL METAL CANS SHIPPED	89,344	54,605	34,739	46,547	42,797
BEVERAGE	54,442	20,768	33,674	44,694	9,748
Beer	28,731	7,353	21,378	27,047	1,684
Soft Drinks	25,711	13,415	12,296	17,647	8,064
FOOD	30,033	28,998	1,035	1,668	28,365
Baby Foods	787	787	-0-	21	766
Coffee	679	679	-0-	-0-	679
Dairy Products	943	736	207	207	736
Fruit, Fruit Juices	4,885	4,859	26	26	4,859
Meat & Poultry	1,589	1,029	560	666	923
Pet Foods	2,968	2,968	-0-	25	2,943
Seafoods	1,089	1,068	21	47	1,042
Shortening	241	241	-0-	-0-	241
Vegetables, Veg. Juices	10,787	10,787	-0-	449	10,338
Other Foods, Including Soup	6,065	5,844	221	227	5,838
GENERAL PACKAGING	4,869	4,839	30	185	4,684
Aerosol	2,202	2,172	30	100	2,102
Motor Oil	546	546	-0-	-0-	546
Paint & Varnish	873	873	-0-	-0-	873
Other Nonfoods	1,248	1,248	*	85	1,163

* Less than 500,000

industry aluminum rose from 10% of metal can shipments in 1972 to 62% in 1979.[173]

Despite the rapid and major inroads by aluminum in the metal can beverage container market, there is considerable evidence that the steel can is becoming a stronger competitor in the 80s due to improved and more cost-effective steel can technology, aluminum vs. steel energy usage, and the recent breakthrough of tin-free, all steel cans by US Steel, which may reduce steel beer-can costs further.[70T] Steel and aluminum can gross discard percentages are projected at 6.3% and 2.3% respectively for 1990 by recent unpublished EPA data compiled by Franklin Associates Ltd.[181] However, the many variables involved in the aluminum/steel beverage can rivalry may result in a slightly higher percentage of steel can containers. The major factor in the 80s dictating which metal is more economical will be energy.[158]

Paper, Paperboard

Paper and paperboard packaging currently comprise 49.4% of containers and packaging gross discards. The paper and paperboard gross discards category can be further subdivided into three categories: corrugated (64%), other paperboard (20%) and paper packaging (16%). Among noticeable trends, paper and paperboard have retained a fairly constant percentage of packaging gross discards, ranging from 49.3% in 1960, to 49% in 1970, to 49.4% in 1980. At the same time the corrugated portion of paper and paperboard packaging has steadily increased, from 54% of paper/paperboard packaging in 1960, to 61% in 1970, to 64% in 1980. This trend is expected to continue to 1990, when EPA/Franklin Associates data project paper/paperboard to be 51% of packaging gross discards and the corrugated component to rise to 67% of paper/paperboard packaging.[181] Two corrugated box trends further impacting on solid waste constituency are: 1) End-Use Industries: Over the past 20 years there has been a definite trend toward durable product use of corrugated boxes (currently 38% of corrugated boxes are for food products, 11% for paper and allied products, 7% for chemicals, and 5% for rubber and plastic products); and 2) Plastic Combination: Increased use of corrugated boxes in combination with plastics is projected in the eighties.[131]

Plastics

Plastics as a percentage of packaging gross discards total 8 percent. A rapid growth trend is shown by comparison with 0.4% in 1960 and 4.7% in 1970.[181] This growth has been at the expense of other packaging materials, primarily paperboard trays, boxes and food tub markets; glass containers, wood boxes, baskets and pallets; and the metal closure part, drum and strapping markets.[131] Plastic containers, as a percentage of all plastic packaging gross discards, also show a growth trend from 46% of plastic packaging discards in 1960 to a projected 56% of plastic packaging discards in 1990.[181]

One of the most recent and spectacular growth trends has been two-liter soft drink containers. First marketed in 1976, they represented 7.6% of soft drink containers by volume in 1978 and 14.6% by 1979.[169] Two-liter soft drink bottle production is expected to rise 25% in 1980 (in a soft drink industry projected to grow only 2-3%).[174] In contrast, one-liter plastic bottles are not price competitive with glass containers and have not expanded as originally expected.

Plastic soft drink bottles will continue to be the primary plastic packaging growth trend through 1984, followed by drums and pails, shipping boxes and cases, and protective foam packaging.[131] By 1990 plastics are expected to constitute 12% of packaging gross discards.[181]

2. Cost and Energy: Current and Trends

Prices have been rising for all packaging materials, in part because of the increasing cost of energy in the 1970s. The strong competition among producers of packaging materials has led to advances in production technology and energy conservation which can swing cost/price factors in favor of different materials from year to year. This intertwining of technology, energy, cost and price factors is discussed in more detail in previous sections on materials found in the waste stream and the impact of recycling on energy costs is reviewed in later chapters on secondary market factors.

Overall, the Department of Commerce forecasts continuing price increases for all materials, especially in energy intensive segments of the packaging industry and plastics, which are derived from energy feedstocks.[131] About 70% of the raw material used to make plastic bottles is from natural gas; 30% is from crude oil.[188c]

However, current and projected energy and plastic resin price increases will not necessarily rule out plastics' edge in packaging, where plastics consumption is expected to grow 7-8% through the 80s.[188b] As previously noted, the plastics industry has made rapid technological strides to cope with rising energy costs. The two-liter plastic beverage container's inroads into the soft drink beverage container market is one example of a cost-effective plastic container. In contrast, one-liter plastic bottles are not price-competitive with glass containers and have not expanded as originally expected.[174]

Despite aluminum's aggressive inroads into steel can markets, the outcome of steel and aluminum can competition in the 80s is still in doubt, due to energy factors and technological advances by the steel industry which have already helped make steel can production more economical. In 1978 energy represented 20% of the price of aluminum, compared with 8.5% of the price of steel, and an industry analyst predicted 50-100% aluminum price increases by 1982 as a result.[158]

TABLE I-E-2

ENERGY CONSUMPTION AND COST FOR DELIVERED 12-PACKS
OF FILLED 24-OZ. FOOD BOTTLES

COST FACTORS	Glass[a]			Plastic(PET)[b]		
	1977	1980	1985	1977	1980	1985
Energy consumed, MM Btu/1000 bottles						
Bottle production and delivery	10.79	10.79	10.79	4.44	4.47	4.50
Corrugated carton production and delivery	3.73	3.73	3.73	3.60	3.60	3.60
Transport of filled pack, 400 mi.	1.61	1.61	1.61	1.12	1.12	1.12
TOTALS	16.13	16.13	16.13	9.16	9.19	9.22
Energy cost, $/1000 bottles						
Bottle production and delivery	19.34	24.33	26.14	7.57	9.37	9.74
Corrugated carton production and delivery	5.48	6.20	6.71	5.28	5.98	6.47
Transport of filled pack, 400 mi.	3.04	3.78	4.19	2.12	2.64	2.92
TOTALS	27.86	34.31	37.04	14.97	17.99	19.13
Net savings in plastic						
Total energy, MM Btu/1000 bottles	-	-	-	6.97	6.94	6.91
Energy cost, $/1000 bottles	-	-	-	12.89	16.32	17.91

[a] Container weight 1068 lb/100 bottles

[b] Container weight 97 lb/100 bottles

Source: Ethyl Corp.

More recently, industry analysts have predicted that steel will have a competitive edge long-term due to anticipated steep aluminum price increases. Yet another factor which may impact on the cost-effectiveness of steel cans is the breakthrough in the development of a tin-free can which industry publications have noted could reduce steel can costs per thousand by about one dollar.[174]

Steel industry representatives share cautious optimism regarding the steel can's ability to become more price competitive in the early eighties.

During the 1970s glass containers have lost market shares to plastic and metal containers in the beverage market and must become more cost-effective to remain competitive. Again, energy and cost/price factors are interwoven and, as discussed in the secondary markets chapter, recycling of cullet is seen by the glass industry as one way to reduce energy costs.

3. Waste Stream Impact - National

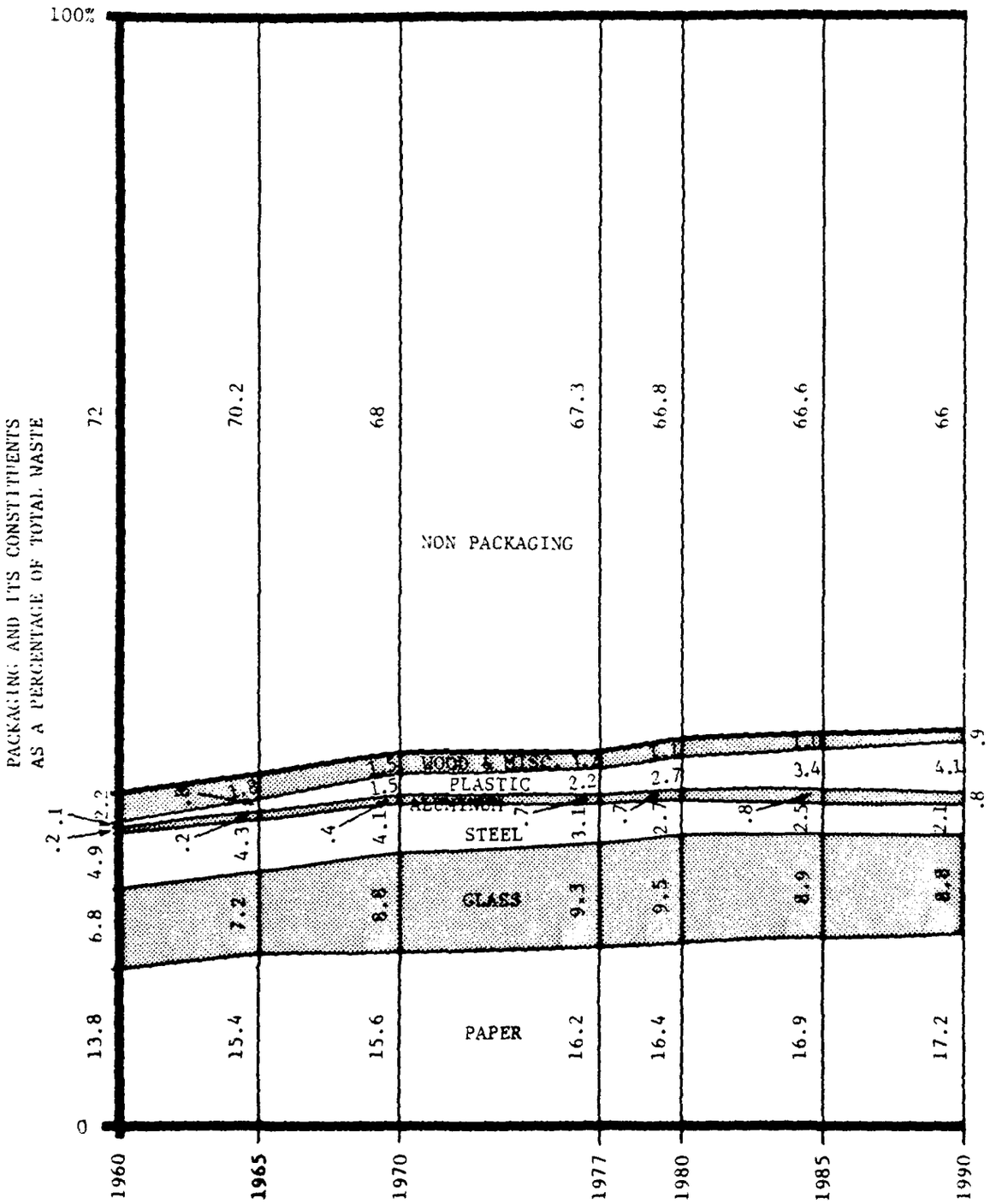
Packaging waste has a short life span and its impact is higher than many other product uses with longer life spans.

Overall, packaging material has maintained a relatively constant proportion of total national municipal solid waste generation ranging from 28-33% of gross discards and 49-51% of non-food product discards from 1960 to 1978. The percentage of gross discards is expected to remain fairly constant, rising to 34% of total gross discards by 1990.[181] This is principally due to trends in lighter packaging materials, through both improved technology and material substitution, and larger family-size containers.

CALCULATION OF PACKAGING PERCENTAGES 1960-1990[181]

	Gross Discards - 10^6 Tons			
	Total	Pkg.	Pkg.%	Pkg.% Non-Food Prod.
1960	95.7	26.8	28.0	49.2
1965	110.7	33.0	30.7	49.7
1970	131.0	41.9	32.0	49.9
1977	146.5	47.9	32.7	50.5
1978	150.4	48.9	32.5	49.7
1990	186.5	63.4	34.0	49.5

FIGURE I-E-2



Source: Franklin Associates for U.S. EPA, 1980.

Growth in packaging will therefore come within packaging constituents, as one packaging type substitutes for another, rather than from extensive packaging growth as a percentage of total discards. Examples of this are the aluminum and steel can rivalry in the beverage market, increased competition between glass containers and cans in the beer market, and the rapid increase of plastic containers. Substitution of paper packaging by plastic may continue while paperboard packaging should remain stable. Flexible packaging may make further inroads into traditional rigid packaging applications.[131]

PART II:

TRENDS IN MARKETS FOR RECOVERABLE CONSTITUENTS

II. TRENDS IN MARKETS FOR RECOVERABLE CONSTITUENTS

A. Secondary Materials Factors

Introduction

This section reviews factors impacting on the marketability of several large constituents of the waste stream. While some materials have a clearly higher market value per ton than others, many variables affect the marketability of any material and should be kept in mind when reviewing potential markets for the waste stream output. Some of these common factors are reviewed in this introduction and a more detailed discussion of each material's marketability follows.

Secondary Material Characteristics

Solid waste generation and composition trends were defined in Part I of this report as post-consumer residential and commercial wastes found in municipal collections. Similarly, this section reviews markets for products used and discarded by the consumer (obsolete scrap). It does not review markets for home scrap (waste generated and recycled within primary materials processing facilities) or prompt industrial scrap (waste generated and recycled within manufacturing facilities), except to note the competition among these various waste materials within the secondary materials marketplace.

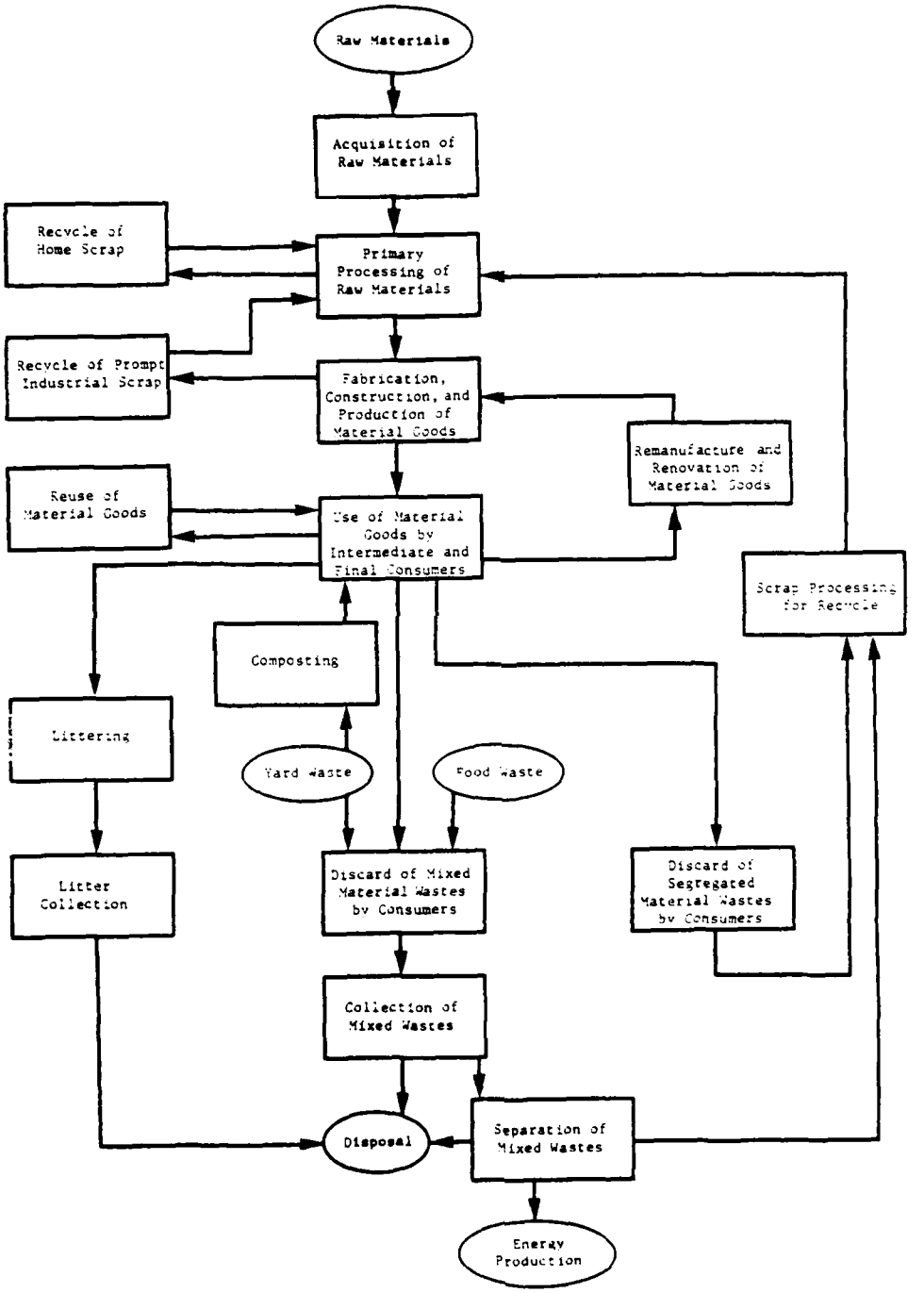
Figure II-A-1 presents a materials system model containing six pathways by which materials are recycled or reused prior to ultimate disposal:

1. Home scrap recycle
2. Prompt scrap recycle
3. Product manufacture or renovation
4. Reuse of material goods
5. Recycle of segregated wastes
6. Recovery of energy and materials from mixed wastes.

While this report is concerned solely with markets for materials used and disposed of by the consumer, as represented by pathways 5 and 6, two other pathways have a direct bearing on the marketability of post-consumer waste materials. Several characteristics of wastes generated by industry (pathways 1 and 2), make them more attractive for recycling purposes. Scrap generated in the primary material processing facility or in the fabrication of manufactured products (i.e. envelope clippings) is available in large quantities. It is also relatively homogenous in nature and free of many of the contaminants caused by contact with other post-consumer wastes, added during final product manufacture, or caused by chemical changes during disposal (incineration). Thus this type of scrap material is almost always preferred by any

FIGURE II-A-1

MATERIALS SYSTEM MODEL
OF
RECYCLE LOOPS AND DISPOSAL OPTIONS



Source: Materials and Energy from Municipal Waste, Office of Technology Assessment, Materials Group, July 1979.

secondary materials buyer over the more heterogenous, contaminated, and smaller quantities reclaimed from post-consumer wastes (pathways 5 and 6), especially when the cost of reprocessing is taken into account.

Since home and prompt scrap are highly sought after for recycling purposes, they are the first to be recycled. Post-consumer waste materials must therefore either be upgraded in quality to compete in the higher priced secondary materials markets or seek lower priced markets whose end use can accept a more contaminated product.

Recycling Technology

Materials are currently reclaimed from municipal wastes by one of two basic alternatives: source separation or recovery from mixed wastes by mechanical means at a centralized recourse recovery facility.

Source separation involves the separation of recyclable materials at their point of generation for segregated collection and transportation to the buyer. As Table II-A-1 indicates, almost all materials are reclaimed from municipal wastes through some form of source separation. It is a process that yields a comparatively high quality waste product that can command prices in the higher ranges of the secondary materials market. It is the only proven method for recovering recyclable newspaper, office paper, corrugated cardboard, color sorted glass, plastics and rubber from municipal solid waste and it is still the best method of recovering aluminum.[117/p.267] Easier to implement, compared with centralized waste processing, source segregation requires minimum capital investment, is labor intensive and can be adapted to communities and facilities of various sizes. The secondary material obtained from a well-managed source separation program yields a relatively homogenous product with low contamination that has the best chance of competing in the secondary materials marketplace.

There is considerable potential for recovering materials from municipal solid waste at centralized resource recovery systems. However, the technology for extracting recyclables from mixed wastes at these facilities is still in its infancy, except for ferrous metals recovered through magnetic separation, and few facilities recover substantial materials for recycling at this time.[117] When materials are recovered from these facilities, they are not of a quality to compete with industrial or source separated municipal scrap and must seek lower priced markets where higher contamination is acceptable. For example, glass container manufacturers can readily use clean, color-sorted glass obtained through source separation techniques. While testing of glass recovery systems at resource recovery facilities is continuing, glass container industry specifications are difficult to meet. However, several building products have successfully been manufactured using lower priced color-mixed waste glass with a higher percentage of contaminants than is acceptable to container manufacturers.

TABLE II-A-1[117]

Estimates and Projections of Recovery of Residential and Commercial Post-Consumer Solid Waste, Selected Materials, (1969-1985)

(in thousands of tons, as generated wet weight)

Material	1960	1970	1977	1985
Ferrous metals				
Source separation	-	-	35	50
Magnetic separation*	50	150	200	200
Mixed-waste processing	-	-	50	400
Total	50	150	285	650
Aluminum				
Source separation	-	10	140	225
Mixed-waste processing	-	-	-	5
Total	-	10	140	230
Paper				
Source separation	5,575	7,115	10,180	12,150
Glass				
Source separation	100	160	500	865
Mixed-waste processing	-	-	-	5
Total	100	160	500	870
Rubber				
Source separation	330	255	160	170
Total Materials Recovery				
Source separation	6,005	7,540	11,015	13,460
Magnetic separation*	50	150	200	200
Mixed-waste processing	-	-	50	410
Total	6,055	7,690	11,265	14,070
Energy recovery from combustibles	-	-	750	9,400
Total recovery	6,055	7,690	12,015	23,470
Total gross discards	87,000	131,000	148,000	175,000
Percent recovered	7	6	8	13
Percent source separated	7	6	7	8

* Includes systems magnetically separating ferrous scrap, but doing no other resource recovery.

Source: Franklin Associates, Ltd., "Post-Consumer Solid Waste and Resource Recovery Baseline," prepared for the Resource Conservation Committee (Washington, D.C., April 6, 1979), p.21.

TABLE II-A-2[181]

Trends in Resource Recovery from Post-Consumer
Residential and Commercial Solid Waste 1960 - 1978
(In Thousands of Tons)

	1960	1970	1973	1976	1978
Materials Recycling					
Paper and paperboard	5,600	7,100	8,730	-	10,400
% of paper and paperboard	19.0	16.1	16.5	-	20.1
Aluminum	-	10	35	-	170
% of Aluminum	-	1.3	3.4	-	11.3
Ferrous metals	100	100	300	-	330
% of ferrous metals	1.0	0.8	2.4	-	2.8
Glass	100	200	300	-	500
% of glass	1.4	1.6	2.3	-	3.3
Rubber	300	300	220	-	140
% of rubber	16.7	11.6	6.8	-	4.7
Total materials recovered	6,100	7,700	9,590	-	11,540
% of gross non-food	11.2	9.2	10.3	11.2	11.7
% of total waste	6.4	5.9	6.7	7.2	7.7
Energy Recovery					
Tons converted (thousands)	-	-	-	300	850
% of gross discards	-	-	-	0.2	0.6
Btu recovered (trillions)	-	-	-	2,700	7,700

Source: Franklin Institute Draft to U.S. E.P.A., June 1980.

While technology at central facilities will undoubtedly improve during the 1980s, source separation will continue to be the primary means of obtaining high quality secondary materials from post consumer wastes.

This report covers specifications developed for materials recovered both by source separation techniques and by mechanical means from mixed wastes at central facilities.

Contaminants mixed in with recovered materials can seriously affect their value in the secondary materials marketplace. Material contamination can damage a buyer's equipment, destroy the quality of the final product, or increase the buyer's material processing costs. High water content, glue on envelopes, aluminum rings on glass bottles, clear glass mixed with colored glass, or glossy magazine paper mixed with newsprint, depending on amount, could all either reduce the secondary materials' value or cause them to be rejected. Sometimes the reclamation process itself can contaminate the recovered materials. Processing at resource recovery plants often results in changes in chemical composition or physical form which make the material unsuitable for many end uses.

Some end product uses require lower levels of contaminants than others. For successful marketing and use, materials must be recovered to specifications, a description of the type of material desired by a buyer. Specifications, and the degree of processing necessary to meet the specifications, vary according to the proposed use of the recovered product. In addition to noting the type of material desired and the level of contamination permitted, if any, a buyer may also specify the form in which the materials should be delivered (crushed, shredded, baled, etc.), the minimum quantity allowed for purchase at a given price, the delivery point at which the price is honored, etc.

Origin specifications for many recycled materials have been developed by secondary material industry trade associations and are based primarily on the origin of each grade of recycled material. Recent origin specifications for paper, metals, textiles and rubber are included in Appendix F of this report and a sample specification for recovered newsprint is shown in Table II-A-3.

Glass manufacturers set standards for acceptance of glass cullet based on color and low levels of contaminating materials, such as metals, organic matter and refractory particles which will not melt in a glass furnace.

Origin specifications have existed for many years and are very suitable for materials reclaimed by source separation methods. Origin specifications, however, are generally unsuitable for materials recovered from mixed wastes in centralized resource recovery plants because processing can cause changes in composition of the recovered wastes. Instead, specifications based on chemical composition of the recovered

TABLE II-A-3[159]

Representative Origin Specifications
for Old Newsprint

No. 1 news

Consists of newspaper packed in bales of not less than 54 inches in length, containing less than 5 percent of other papers.

Prohibitive materials may not exceed	1/2 of 1%
Total outthrows may not exceed	2%

Overissue news

Consists of unused overrun regular newspapers printed on newsprint, baled or securely tied in bundles, and shall contain not more than the normal percentage of rotogravure and colored sections.

Prohibitive materials	None permitted
Total outthrows	None permitted

A prohibitive material is any included in a bale which if found in greater than the specified level would damage the papermaking equipment and/or destroy the quality of the final product. Examples are latex adhesives, magnetic inks, plastics, or asphaltic papers.

Outthrows are contaminants which make the product unsuitable for consumption at the grade specified. Outthrows usually consist of materials which are compatible with the papermaking process but if found in amounts greater than the specified level will significantly degrade the quality of the final product. Examples are cloth bindings, chipboard, string bindings, and glassine.

TABLE II-A-4

Sources of Specifications for Recovered Materials

All materials

ASTM Committee E-38,
Resource Recovery

American Society for Testing
And Materials
1916 Race Street
Philadelphia, PA 19103

Steel

Institute of Scrap Iron and
Steel, Inc.
1627 K. Street, N.W.
Washington, D.C. 20006

Paper

American Paper Institute
260 Madison Avenue
New York, NY 10016

Paper Stock Institute of
America
330 Madison Avenue
New York, NY 10017

Glass

Glass Packaging Institute
2000 L Street, N.W.
Washington, D.C. 20006

Nonferrous metals

National Association of Recycling
Industries, Inc.
330 Madison Avenue
New York, NY 10017

Aluminum

Aluminum Association
818 Connecticut Avenue, N.W.
Washington, D.C. 20006

National Association of Recycling
Industries, Inc.
330 Madison Avenue
New York, NY 10017

Aluminum Recycling Association
900 17th Street, N.W.
Washington, D.C. 20006

TABLE II-A-5[117]

IMPACT OF SOURCE SEPARATION OPTIONS
ON BTU CONTENT OF MUNICIPAL TRASH

Type of Separation Program	Average Btus per Pound of Trash	Percent Change
No source separation	4,600	-
High level, all wastes* (24% reduction in total waste stream)	4,660	+1.3
Low level, all wastes* (10% reduction in total waste stream)	4,510	-2.0
High level, newspaper (7% reduction in total waste stream)	4,440	-3.5
Low level, newspaper (3-4% reduction in total waste stream)	4,550	-1.1
Glass and cans (beverage container legislation)	4,890	+6.3

* All wastes defined as glass, cans, newspaper, office paper, and corrugated cardboard.

Source: U.S. Environmental Protection Agency, Office of Solid Waste, unpublished study, 1979.

product are needed; Committee E-38 of the American Society for Testing and Materials was established in 1974 to develop and adopt this type of specification. Work is continuing by the committee and updated specifications can be obtained from ASTM.[160] Composition specifications are also included in this report.

Interim Markets/Final Markets: Selecting a Buyer and the Role of Scrap Processor

A market survey of the geographic area surrounding a facility may unearth both interim and final markets for any given material. The highest prices are from the final markets (primary aluminum companies, secondary newsprint manufacturers, glass container manufacturers, etc.), with middlemen (scrap processors) offering a price based on their role as interim markets. Final selection of a buyer for secondary materials, however, requires that the seller first survey both his requirements and those of the prospective buyer, since the economic viability of any recycling program involves a variety of factors.

The seller must consider:

- Amount of material that can be generated;
- Quality of material that is generated and degree to which it meets a buyer's specifications
- Manpower and equipment requirements for collection and processing procedures;
- Current collection/disposal costs;
- Cost of collecting, separating and processing materials;
- Market prices and ability to obtain long-term contract with floor price;
- Location of buyer;
- Services offered by buyer.

The buyer's requirements may include:

- Minimum amount of material to meet intended end use;
- Guarantee of quality of material to meet intended end use;
- Special processing (baled, shredded, etc.);
- Possible requirement for long-term supply commitment.

It is essential to evaluate any price in terms of the services offered by the buyer and the economic impact of a buyer's requirements on one's own processing costs. The highest prices are from the final

markets, but their specifications may be impossible to attain, or attain economically. In that case, the role of the scrap processor becomes all the more important. By accepting secondary materials in small quantities and with higher degrees of contamination, the scrap processor serves as an intermediary and prepares materials to end-market specifications. They will also pay less, since they must invest time and money in material preparation, but their services can often more than make up for the lower price. The scrap processor is usually located closer to the seller, given the regional nature of many markets, and can often better absorb costly transportation costs because of the high volume and processing techniques which reduce material bulk and increase density.

Economics

The economics of material recovery, from a seller's perspective, are related to several issues. Costs of processing materials for buyer's specifications can be prohibitive and even cost-effective programs are often subsidized by the volunteer labor of residents who separate out newspaper, etc. The cost of collection and disposal of waste by traditional means must be weighed against the cost of materials recovery. If the primary goal of an office recovery program is to cut waste volume, mixed paper will be collected and the resulting price will be low. If the aim is to attain high sale prices and show a greater profit, additional time will be taken to sort out high quality ledger. Some market prices fluctuate more than others, e.g., paper. A decision must be reached whether to obtain a longer-term contract with a floor price or to take a chance on the spot market. Buyer services, such as the mobil unit *Reynolds Aluminum Company* will bring on base for purchase of aluminum from individual buyers, eliminate source separation costs by the seller. Low volume materials, e.g., as aluminum, may bring such correspondingly high prices as to make them very economical to extract from the waste stream. As noted earlier, prices for materials are higher from end use buyers than from scrap dealers. When transportation costs are considered, the high prices offered by an end user in another state may not be attractive. Gordian's forecast of material prices, shown in graphs are based on sale to local markets, without transportation.

Impact of Quality on Value

Appendix F, "Paper Stock Standards and Practices," describes the origin specifications for paper stock for repulping in the United States and Canada as of January, 1980. Possible additional requirements must, of course, be checked with individual buyers.

The most desirable grades of wastepaper are those with the highest quality or purity which can also be accumulated in large quality. The general types of paper stock grades fall within two basic groups, the bulk and high grades. The bulk grades, used in large quantities in paperboard and constuction products, include newspapers, corrugated

TABLE II-A-6[160]

Typical Prices and Gross Revenues for Recovered Resources Delivered to Market

1978-79

Resource type	Delivered price[a]	
From centralized resource recovery		
Iron and steel	15-40	$/ton
Glass	10-20	$/ton
Aluminum	300	$/ton
Other nonferrous metal	100-200	$/ton
Dry fuel (RDF)	0.50-1.00	$/million Btu
Steam	1.50-3.00	$/1000 lb
Medium-Btu gas	1.50-3.00	$/million Btu
Electricity[c]	1.5-3.5	¢/kWh
From source separation		
Newspaper	20-45	$/ton
Books and magazines	5-20	$/ton
Corrugated paper	15-45	$/ton
Office paper	75-120	$/ton
Steel containers	20-40	$/ton
Glass containers[d]	20-30	$/ton
Aluminum containers	300	$/ton

[a]Source: OTA estimates from various industry sources.
[b]Based on typical amounts recoverable. Must be reduced to account for freight costs.
[c]Wholesale prices.
[d]Color sorted.

boxes and mixed papers. Mixed papers include a wide range of the lowest quality paper stock such as unsorted mixed paper obtained from office buildings. High grades, which are high quality fibers which can substitute directly for wood pulp, include cuttings from converting processes and high quality papers for data processing centers. They also included de-inking papers, high quality bleached papers from printing plants and other converters or very well sorted office ledger paper. In all cases, paper grades from converting sources compete with corresponding post-consumer waste grades due to lower levels of contamination.

The type of pulp in paper, groundwood, sulfite, sulfate, or semi-chemical, is also very important. Paper stock with a high percentage of bleached sulfite pulp is more valuable than groundwood. Finally, bleached or unbleached fiber content affects paper value.

Those paper grades most applicable to potential Navy recovery are, in order of descending quality and value are:

- o computer tab cards,
- o computer printout,
- o white ledger,
- o colored ledger,
- o newspaper, and
- o mixed low grade.

Mixed papers can be further hand sorted to bring a portion up to high quality, such as when white office ledger is extracted.

A number of materials introduced during production, fabrication, use and disposal of a product will contaminate paper and can either destroy or lower its value in the secondary market.

The U.S. EPA publication, Office Paper Recovery: An Implementation Manual, gives a good review of grades found in government office facilities and explains some potential contaminants. A summary of these grade characteristics is given below.

Totally white paper with black ink is usually high grade white ledger. There are two kinds of paper that qualify as white ledger:

Sulphites - light-weight office papers (bond, copy paper, onion skin) and

Sulphates - heavy white or colored papers used most commonly in mailing (envelopes, business cards, report covers).

Most office papers are sulphites. Groundwood content, and treated, coated or padded paper are considered contaminants. Other paper qualifying as white ledger are blue and green computer printouts and non-glossy book and magazine pages.

Any sulphate or sulphite paper other than white is considered colored ledger. White ledger paper with other than black ink is also generally considered colored ledger, as are computer printouts with colors other than blue and green strips. Ground wood content is also considered a contaminant in colored ledger.

Manila tab cards have a higher value than colored tab cards, but manila tab card grades may inclued cards with tinted margins. These grades are primarily sulphite or sulphate papers.[127]

Sample origin specifications for newspapers and corrugated paper were shown in Table II-A-3 in the Introduction to II-A.

1. Paper

Markets-Current

Technology: From a technical standpoint, the paper industry has long been capable of utilizing secondary fiber. Business, printing and tissue mills, paperboard mills, and construction paper mills all utilize secondary fiber, although the type of waste fiber required and limits of recycled content vary from mill to mill. In contrast, production of new newsprint from 100% recycled newspapers is a relatively recent application for wastepaper.

All of these applications are dependent on labor intensive collection and separation techniques, which sort out identifiable paper grades with minimum contamination levels. Source separation of waste paper at the point of generation best meets most grade requirements, and is the most common method of collection. A much smaller quantity of wastepaper is collected by hand sorting and mechanical separation from mixed waste, with resulting higher levels of contamination. Paper fiber recovered after processing in resource recovery plants cannot be utilized for manufacture of new paper products.

Market Viability

Applications for various grades of paper stock relate to the level of activity in four general types of paper mills and by their interactions: (a) de-inked newsprint mills utilize newspaper; (b) business, printing, and tissue paper mills utilize pulp substitutes, de-inking grades, and mixed paper; (c) paperboard mills utilize corrugated, mixed paper and newsprint; and (d) construction paper mills utilize mixed paper, newsprint is corrugated. The dominant waste grade(s) for each type of paper grade is underlined. Markets for combination paperboard and construction are more cyclical than markets for most other grades of paper and board. In some grades, substitution, such as mixed for news, may take place in periods of changing demand.[167]

While a high percentage of all post-consumer waste recycled from the waste stream is paper (92% in 1976), paper markets are volatile and prices fluctuate widely. Corrugated paper was the largest component of post consumer waste recovered from the waste stream in 1976 (49%), followed by mixed paper (28%) and non-industrial newsprint (22%). Total demand for wastepaper, both post consumer and industrial, is also highest for corrugated, with newsprint and mixed paper from both sources next in demand. Prices for these three bulk grades, however, are much lower than prices for high grade de-inking papers such as sorted ledger paper, tab cards and computer printouts.

As noted earlier in this report, most paper and paperboard consumption is very senstive to changes in the real gross national product, and paperboard is particularly sensitive. Decreased demand for many paper products affects demand for wastepaper, with post-consumer waste suffering much more than higher quality industrial waste. The second paper market's erratic price swings in response to demand are clearly pictured in Figures II-A-2 and II-A-3. In fact, wastepaper prices fluctuate even more widely than consumption patterns as suppliers of secondary materials respond to marketplace demand.

The introduction of technology to produce 100% newsprint did much to stabilize newsprint demand and prices in recent years. Newspaper production, unlike paperboard markets which also utilize newsprint, is not highly susceptible to changes in the real GNP.

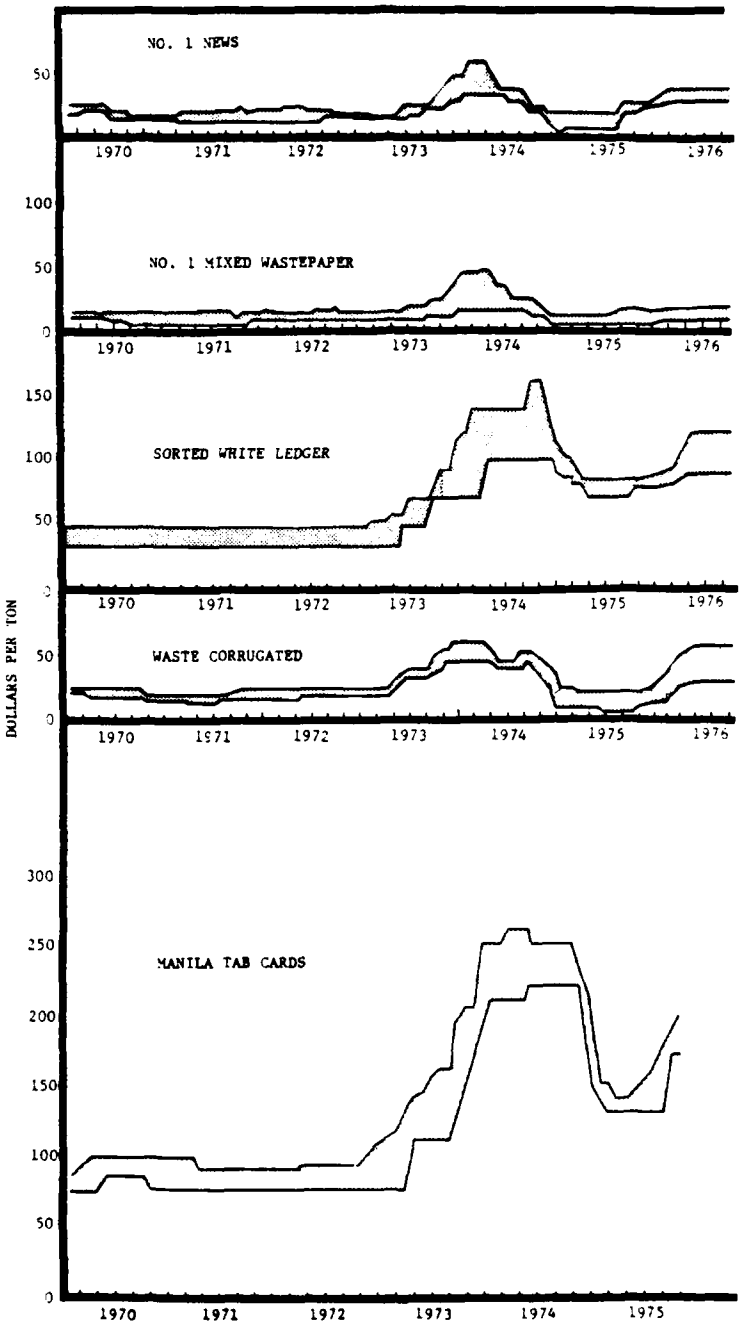
Paper prices vary also by geographic area. West Coast prices, for example, have been much higher for all paper grades for a number of years as the quantity of wastepaper exported to Asian countries climbed. (Exports were 16% of the total recovery on the West Coast in 1973, compared to under 8% in the south-central regions and under 2% on the East Coast.)[110] Exports have historically represented a small portion of total wastepaper recovery in this country, with demand growing only from 1.6% in 1950 to 3.7% in 1970. From 1970 to 1978 however, exports increased from 3.7% to over 15% of total wastepaper recovery.

Another factor in assessing the marketability of paper components is the cost of processing paper to market specifications. Paper specifications are discussed in more detail in later pages, but source separation to attain the highest possible value for each grade requires considerable labor. Wastepaper dealers perform an important function in upgrading paper for end markets, but their prices will, of course, reflect this service.

Markets-Future

Energy: Recent studies have documented the total energy savings in recycling wastepaper compared to use as an energy source. The actual purchased fuel savings in the manufacture of each of the individual grades of paper (recycled vs. virgin) is less clear. Newsprint and

FIGURE II-A-2

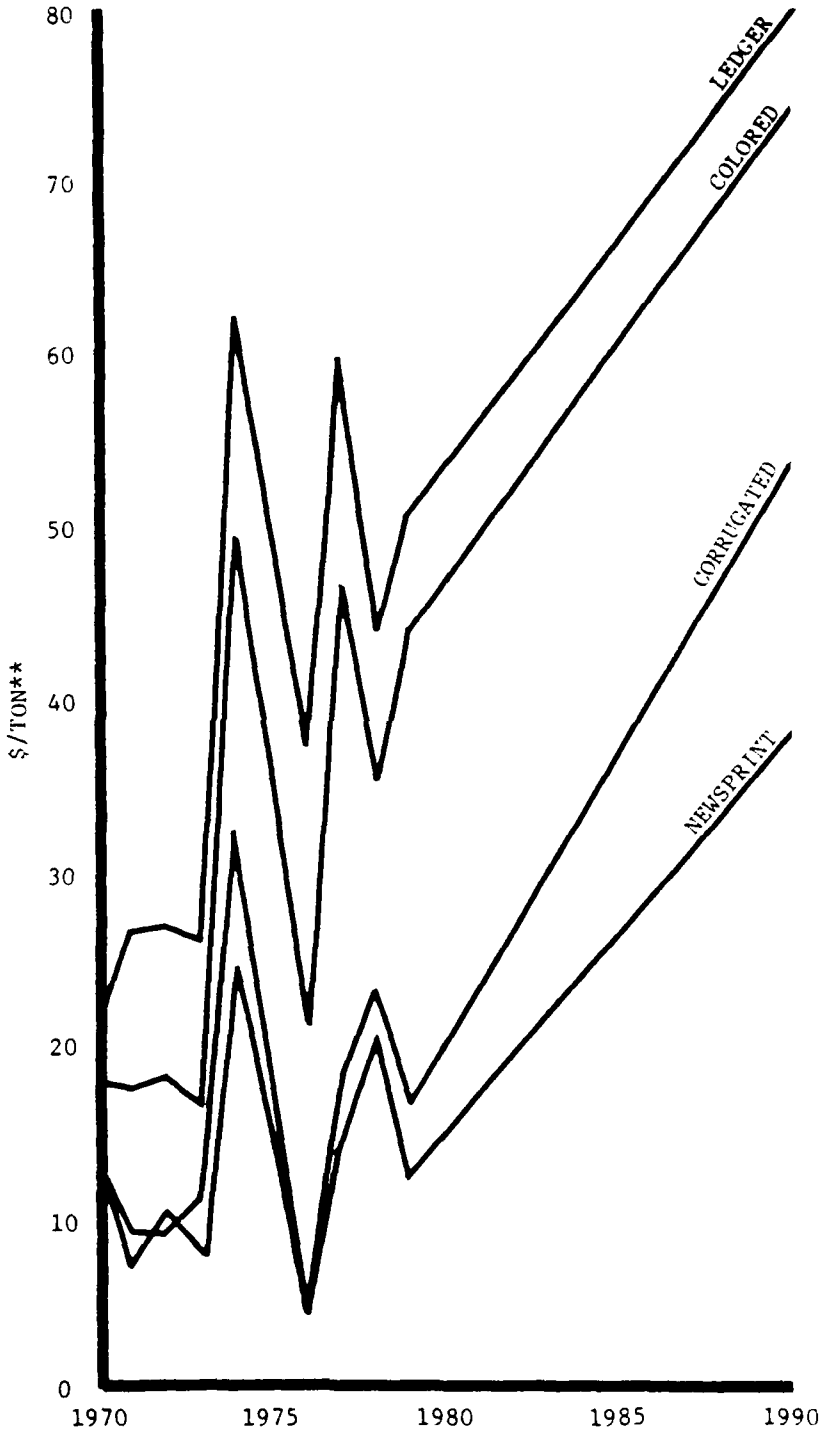


Plotted on the graphs are weekly price quotes appearing in Official Board Markets for five important wastepaper grades since 1970. The price range presented for each grade reflects the spread of the high weekly quoted prices among four representative market areas: New York, Chicago, Los Angeles, and the South.

FIGURE II-A-3

PRICE TRENDS

POST CONSUMER WASTE PAPER BY GRADES*



* f.o.b. Local Baler
** Unadjusted for Inflation

TABLE II-A-7

TARGET SPECIFICATION FOR RECOVERED NEWSPRINT

Grade title:	Recovered News (equivalent grades: Folded News, Regular News, Ordinary Folded News, No. 1 News)
Description:	Consists of folded newspapers including the normal percentage of rotogravure and colored sections
Packing:	Packed in bales of standard dimensions, not less than 54" long, approximately 1000 to 1500 lbs. per bale
Moisture:	Packed air dry
Prohibitive materials:	Less than ½%
Outthrows:	Less than 2%
Water solubles:	Less than 2% of the acceptable paper[a]
Organic solubles:	Less than 2% of the acceptable paper[b]
Ash:	Less than 1% of the acceptable paper[c]

Notes

a. Determined by ASTM D-1162 or equivalent
b. Determined by ASTM D-1804 or equivalent
c. Determined by ASTM D-586 or equivalent

semichemical paperboard (a corrugating medium) both utilize less purchased fuel when secondary fiber is utilized in the manufacturing process, according to a recent DOE report. The same report notes the need for further study on other grades.[139] The U.S. EPA Third Report to Congress and a recycling industry trade publication give figures comparing kWh required to manufacture virgin and recycled paper that show a 63-64% energy savings in the manufacture of recycled paper (all grades).

In any case, the paper industry's ability to internally generate energy makes energy less of a factor in future secondary paper markets than some other materials.

Materials: A recent study for the paper industry forecasts that the total wastepaper (including industrial waste) recovery rate, as a percentage of paper production, will increase gradually from 24% in 1976 to almost 26% in 1990.[130] A recent U.S. DOE report setting voluntary recycling targets for the industry set a target of 23%, a reduction in percentage of production but a 26% increase in tonnage. Gordian's projections of wastepaper recovery are shown in Figure II-A-4 and project a recycling rate of 35% of post-consumer waste.

In the industry study forecast, corrugated is expected to remain the most utilized grade in paper production, increasing as a percentage of total waste utilized by the industry. Newspaper recovery, due to recycled newsprint production, is also expected to increase at a high rate. This increased demand, together with their high degree of concentration and relative ease of separation from other wastes make them excellent materials for Navy paper recovery efforts.[130]

Recent studies regarding office paper recovery indicate the economic feasibility of recovering high grade, source-separated paper from general office waste streams. While mixed office paper recovery requires less labor to collect, the vastly increased prices and profits realized through the sorting of ledger, tab cards and printouts make recovery of these materials worthy of high consideration despite much lower production growth in industries forecast to utilize these high grade papers.[127, 185] Table II-A-9 gives a cost analysis of a general office building paper recovery program. Table II-A-8 gives the composition of EPA headquarters office waste, typical of six other buildings also studied.

Industrial Practices and New Technologies: Industry structure and practices have discouraged wastepaper recycling through the development of large companies in a vertically integrated industry which controls much of its own raw material source - timber. Federal tax policies have encouraged this use of timber resources. With control of a stable raw material source and large capital outlays for pulping processes which utilize virgin fibers, there was little incentive to recycle paper and, indeed, the recycling rate as a percentage of total consumption dropped

FIGURE II-A-4

TRENDS IN RESOURCE RECOVERY
FROM POST CONSUMER WASTE, 1960-1990
BY PERCENTAGE OF AVAILABLE WASTE PRODUCT

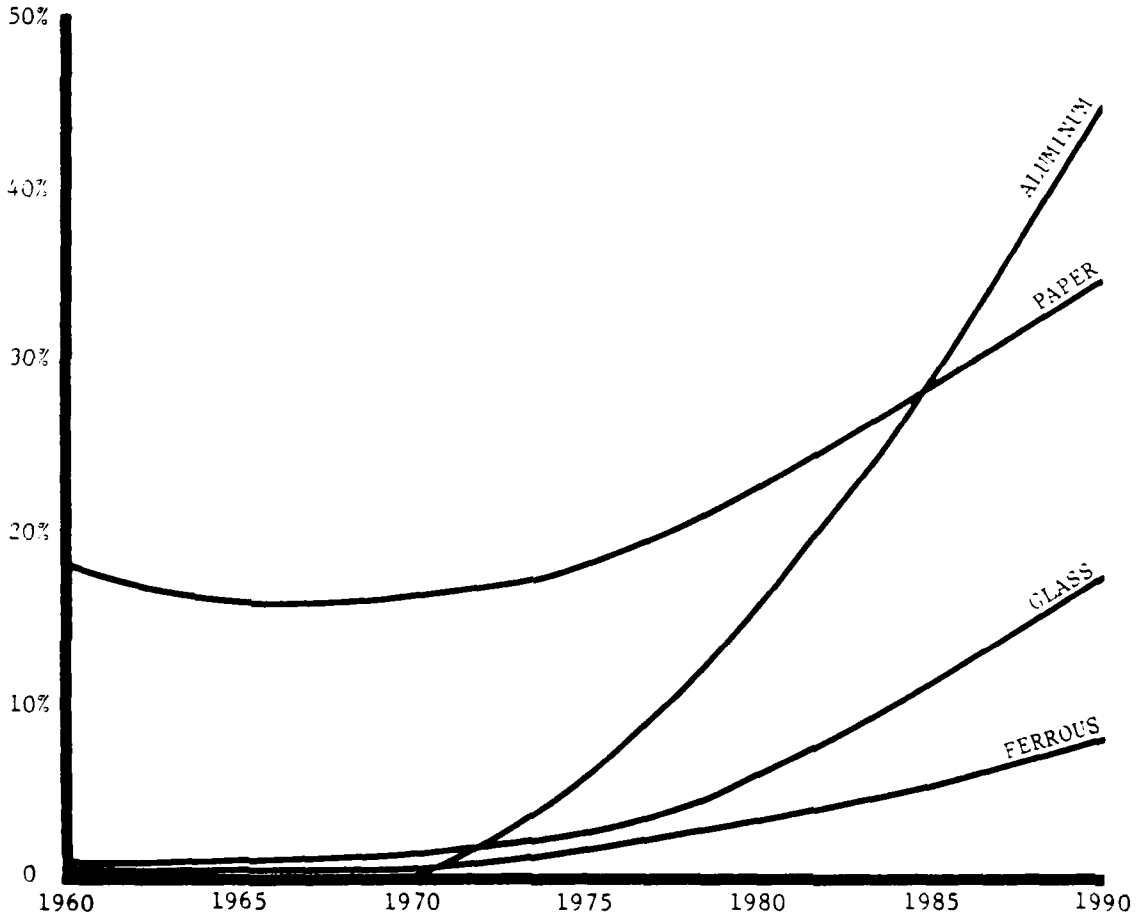


TABLE II-A-8[127]

WASTE COMPOSITION SAMPLING PROCEDURE FOR OFFICE PAPER RECOVERY PROGRAM

1. **Separate a representative mixed compacted waste sample of about 50 lbs. from a collection cart or storage bin placing it in a container of known volume and weight.**

2. **Weigh the sample and estimate the volume (cubic feet or yards). Example:**

   - o Estimated volume of the sample = 2.5 cu.ft. (0.09 cu.yd.)
   - o Gross sample weight 35.6 lbs.
     -container weight 1.0 lbs.
     Net sample weight 34.6 lbs.

3. Compute density (lbs./cu.yd.) by dividing net sample weight (lbs.) by estimated sample volume (cu.yds.):

   - o 34.6 lbs. + 0.09 cu. yds. = 384 lbs./cu.yd.

4. Divide the sample into components listed in the following waste generation and composition tally sheet, placing each material in a corrugated box or other container whose empty weight has been recorded.

   - o Weigh each box separately and subtract the container weight to obtain the net material weight.
   - o Compute the percentage of total weight represented by each material.

These four steps should be repeated several times in order to develop valid density and composition averages.

Sample Weight 34.6 lbs.	lb.	Total %
Paper		
White ledger	13.9	40.2
Colored ledger	1.1	3.3
Computer tab cards	0.2	0.7
Computer printout	3.6	10.6
Newsprint	4.3	12.5
Corrugated	1.9	5.6
Books	0.6	2.0
Cardboard files	0.8	2.5
Other	3.0	8.9
Garbage	1.1	3.3
Metals and Glass	1.7	5.1
Textiles, Plastics, and Wood	0.4	1.4
Special	1.3	3.8
TOTAL	34.6	100.1

5. Once the average density and composition are known, various conclusions can be drawn.

   a. Multiplying the density by the cu.yd. disposed of each month yields an estimate of total monthly solid waste generation.

   b. Using composition percentages, the total generation can be broken down into individual material groups to give an indication of the quantities of high-grade paper in the wastestream.

Compactor Capacity	Number Emptied per month	% Full When Emptied	cu yds/ Month
40 cu yd	4	100%	160

384 lbs/cu yd x 160 cu yd/month = 61,400 lbs/month or 30.7 tons/month

Type of High-Grade Paper	Total Waste Generation	x	% of Paper in the Wastestream	=	Generation of Paper
White ledger	30.7 tons/mo	x	40.2%	=	12.3 tons/mo
Tab cards	30.7 tons/mo	x	0.7%	=	430 lbs/mo
Computer printout	30.7 tons/mo	x	10.6%	=	3.2 tons/mo

TABLE II-A-9

SAMPLE SOLID WASTE MANAGEMENT COST ANALYSIS FORMAT ($/MONTH)
1,800 EMPLOYEES GENERAL OFFICE BUILDING

Contributing Factors	Prior to paper recovery program implementation	Fully allocated costs after paper recovery program implementation	Actual costs after paper recovery program implementation
COSTS			
Collection Labor			
mixed waste @ $5/hr	$3,960	$3,510	$3,960
recovered paper @ $5/hr		630	
Subtotal Collection Labor	$3,960	$4,140	$3,960
Collection Equipment			
mixed waste @ $10/100 employees/month	180	180	180
recovered paper:			
o desk-top containers @ 1/employee		30	30
o central collection containers @ 1/20 employees		3	3
o hand truck @ 1/building		3	3
Subtotal Collection Equipment	$ 180	$ 216	$ 216
Storage			
containers			
equipment		$ 30	
space			
o mixed waste @ 160 sq ft x $0.30/sq ft/month	$ 48	48	$ 48
o recovered paper @ 140 sq ft x $0.30/sq ft/month		42	
Subtotal Storage	$ 48	$ 120	$ 48
Administration			
general overhead@ 10% of labor, equipment and storage	$ 419	$ 448	$ 422
source separation administration @ 15 min/100 employees/month x $8/hour		40	
publicity and education materials @ $1/100 employees/month		18	18
Subtotal Administration	$ 419	$ 506	$ 440
Disposal			
mixed waste @ $27.50/ton	$ 844	$ 574	$ 709
Total Solid Waste Management Costs	$5,451	$5,556	$5,373
SAVINGS			
Revenue			
recovered paper @ $30/ton x 9.9 tons/month		$ 594	$ 594
Net Solid Waste Management Costs	$5,451	$4,962	$4,779
POTENTIAL SAVINGS			
$ per month		$ 489	$ 672

50% from 1944 to 1973.[110/p.47] Several forces are combining to reverse this trend.

Recycling of newsprint for the production of 100% recycled newsprint has already been mentioned. Within the next 2-3 years new plants will open in the Midwest, Mexico, and Arizona. Publishers in Oregon have just started using recycled newsprint. One major Canadian plant in Ontario just announced it is expanding capacity and will install a secondary fiber capability that will utilize 61,000 tons in 1981 and 100,000 tons by 1984. While the goal is to obtain most paper from Canada, in the beginning up to 50% is expected to be obtained from the United States. These and other expansions (new plants and added capacities) will both expand demand and stabilize newsprint prices by expanding the newsprint recycling base.

Increased availability of newsprint, and corrugated and high grade papers through municipal, federal and commercial source separation programs implemented to cut rising disposal costs will encourage expansion of industry recycling efforts by providing a steady source of raw material.

New Technologies

New technology and applications for utilization of wastepaper, such as the breakthrough in newsprint manufacture, would certainly increase future markets. Current research and industry experiments have demonstrated that corrugated use in the production of unbleached draft paper is a cost-effective way to increase output. This has traditionally been a virgin fiber process and use of corrugated is expected to increase wastepaper use from 4% to 18% by 1987.[130] Source separation will continue to be the major collection method through the 1980s.

Lower capital investments are required in the construction of recycling mills as opposed to pulp mills. This may lead to an increase in new mills nearer to stable wastepaper sources. Capacity additions to virgin mills are cost-effective ways of increasing capacity through wastepaper use with minimum capital investment. The provisions of the National Energy Act which provide a tax credit for recycling equipment purchases and the provisions in RCRA for promotion of recycling will also increase recycling, although the exact extent is not yet known. The industry case mentioned earlier (26% of production by 1990) did not take the tax credit incentives into consideration.

Wastepaper

Exports are expected to continue to increase throughout the 1980s, increasing this area of demand.

The availability and price of virgin pulps in the 1980s is difficult to assess, but it is possible that virgin fiber supplies may

tighten and increase in price, making additional recycling more attractive. Opinions vary on whether RARE II legislation, which designates some areas for wilderness preservation and opens up others for multiple use, will tighten or increase supply. The results of continuing paper industry lobbying and governmental planning will probably not be known for a while. A June 1980 editorial in Pulp & Paper, however, also noted a disturbing trend affecting southern timber. Recent studies point to a declining southern commercial forestland base, despite an increasing volume of pine, due to shrinking inventories of small diameter trees. The trend has developed because of a sharp drop in pine regeneration and threatens to adversely affect virgin fiber supplies after the current mature crop has been harvested.

Price Trends

Price trends for paper projected by Gordian are noted in Figure II-A-3 (page 69 above) and are projected for four categories: white ledger, colored ledger, corrugated and newsprint. The prices are not adjusted for inflation and assume sale to a wastepaper dealer instead of end user.

Elasticities

The term elasticities, as used in this study, refers to the responsiveness of supply and demand to price changes (i.e., the supply of a commodity is price in-elastic if no increase in supply results, no matter how high a price is offered; similarly the demand for a product is price in-elastic if no greater demand for a product results, no matter how low a price is asked).

Elasticities are expressed as a ratio of supply or demand change to price change. For example, the supply elasticity of a commodity is 0.5 if a 100% increase in price results in a 50% increase in supply; the supply elasticity is 1.5 if a 100% increase in price results in 150% increase in supply, etc. Specifically, the supply elasticity is defined as the percentage increase in supply, divided by the percentage increase in price.

The responsiveness of the supply (or demand) of post-consumer materials to the prices paid for these materials is measured over a relevant time frame. Typically, the time frame is either: short-term (3 to 6 months), a period too short to be influenced by production system changes; medium-term (6 months to 5 years), a period influenced by production system changes but too short a time period to be influenced by technological advances; or long-term (5 to 10 years), a period of time long enough to be influenced by technological or institutional changes.

Elasticities of Paper: Many studies have been performed attempting to determine the supply elasticity of paper from municipal waste. The Environmental Law Institute estimated a supply elasticity of 0.4 for all

paper; Thomas Plout of Regional Science Research Institute estimated elasticities of 0.1 for mixed paper, 0.19 for corrugated and 0.25 for newsprint.

ICF Incorporated refined both studies by assuming all industrial waste paper is reclaimed regardless of price and factored out industrial scrap (30-40% of all reclaimed scrap paper) yielding an elasticity of 0.6-0.7 for all wastepaper and 0.2-0.3 for the 60-70% of paper that is municipal waste scrap. These elasticities are for medium-term and short-term, respectively.

ICF suggests that long-term elasticities would be approximately 0.8 based on an assumption that over time higher secondary prices might help bring about technical changes which would increase supply response.

Further refinement of the elasticities, by ICF, suggests that large volume generators of corrugated waste such as grocery stores and department stores already recycle their waste, so additions to the corrugated recovery market would come from smaller and less accessible sources which could not respond as quickly to price change. ICF calculates a range of 0.5 to 1.6 for commercial establishments and buy-back centers.

Elasticities for separate collection of newsprint are between 2.3 and 9.1. The overall estimate of wastepaper supply elasticity is 0.4 to 1.7. Based on these elasticity estimates, commercial establishments with elasticities of 0.5 to 1.6 would increase recovery from 6,492,000 tons per year to 7,844,000 -- 10,820 tons/year at an increase in price from $36/ton to $51/ton. Buy-back centers with the same elasticity range would increase recovery from 1,787,000 tons/year to 2,122,000 tons/year -- 2,859,000 tons/year at a price increase from $40/ton to $55/ton.

The most price-elastic segment and the one of most interest to the Navy, separate collection, has a supply elasticity of between 2.3 and 9.1.

A $15/ton increase in the price paid for paper would increase recovery from 101,000 tons/year to 188,000 - 446,000 tons/year.

These elasticities suggest that a separate collection program might be highly successful in times of moderately increased waste paper demand. They also suggest that financial incentives to low volume waste paper generators (i.e., families) would yield a significant increase in supply.

2. Glass

Markets - Current

Technology: Post-consumer glass can be recovered before or after it is mixed with other trash. However, most glass is recovered through source separation programs, with the highest percentage recovered through buy-back centers (90%) and the balance coming from voluntary recycling and municipal separate collection programs.[152/p.13] A very small percentage of recovered glass currently comes from mechanical separation from mixed waste.

Glass container manufacturers currently have the technology to readily use clean, color-sorted glass obtained via source separation techniques. This cullet can be used directly to substitute for virgin raw materials in large percentages in the furnace charge,[183] and almost all glass furnaces can use clean, color-sorted glass,[143] although changes in the manufacturing formula must be made to properly receive the cullet. Cullet can be used as more than 60% of the charge[186e] and from a technology standpoint manufacture of glass from 100% cullet appears possible.[183]

As noted later in this section, the lower quality glass reclaimed from mixed wastes is not suitable for use by container manufacturers. However, a wide number of other products have successfully been manufactured using this lower quality mixed cullet, including building products such as bricks, floor and acoustical ceiling tiles, glass wool insulation, foamed glass products and piping. Waste glass can be utilized as a substitute for clay in the manufacture of bricks and other clay-fired products and as an aggregate in asphaltic concrete.

Economics: Currently the market for post-consumer glass cullet is primarily for high quality, color-sorted uncontaminated glass cullet suitable for mixing with furnace charges in the manufacture of glass containers.

Almost all glass container manufacturers throughout the country operate glass buy-back programs at their plants.[152] Intermediate glass processors are growing in number, especially in states affected by container legislation. A list of intermediate glass processors is included in Table II-A-10. The exceptionally high transportation costs for glass cullet increase the need for local intermediate glass processors.

Almost all glass furnaces can utilize the higher priced color-sorted glass, while only furnaces making colored glass can use color-mixed cullet.[143/p.61]

In the other by-product markets, glass cullet must compete with very inexpensive alternatives such as sand and gravel. Therefore

TABLE II-A-10

INTERMEDIATE GLASS PROCESSORS IN U.S.*

Intermediate Glass
Processor/Location

NEW ENGLAND AREA

Barrett Trucking
Burlington, Vt.

Maine Beverage Containers
Portland, Maine

Maine Recycling Corp.
Topsham, Maine

Matcom, Inc.

Salem, Mass.

Recycling Enterprises, Inc.
Oxford, Mass.
Binghampton, NY
Berlin, NJ

Resource Recovery Systems, Inc.
Branford, Conn.

Tiverton Recycling
Tiverton, R.I.

Waste Control
White River Junction, Vt.

WEST COAST AREAS

ABC Recyclers
Medford, Ore.

Circo Glass Co.
Madera, Calif.
Los Angeles, Calif.
St. Louis, Mo.
San Leandro, Calif.

Clayton Ward Co.
Salem, Ore.
Kennewick, Wash.
Redding, Calif.

Sessler Scrap Co.
South Gate, Calif.

OTHER AREAS

American Glass & Reclaiming Co.
Jacksonville, Fla.
Tampa, Fla.

Bassichis Co.
Cleveland, Ohio

Cincinnati Cullet Co.
Cincinnati, Ohio

Container Recovery Corp.
Marion, Ohio

Dlubak Cullet Co.
Natrona Heights, Pa.

Keystone Cullet Co.
Greensburg, Pa.

Recom
Milwaukee, Wis.

Recycle Unlimited
Grand Rapids, Mich.

* NCRR Bulletin, September 1979.

marketability for these technically successful uses for recovered glass is limited.[160]

Markets - Future

There are indications that the demand for glass cullet, particularly clean, color-sorted cullet, will increase in the 80s.

For a number of reasons, glass container manufacturers, who routinely use 10-15% in-plant cullet in each batch of new glass, have recently become more interested in using post-consumer glass in the manufacturing process.

The first reason is energy-related. The industry uses a large amount of natural gas as a fuel and energy needs decrease as the amount of cullet increases. This is due to the lower melting temperature of waste glass cullet compared to virgin materials.[160] A side benefit from lowered furnace temperatures is that the life of refractory furnace linings is extended,[186e]

Northwestern Glass's Seattle plant, which currently utilizes about 10% mix of cullet in its yearly production of 130,000 tons of glass, recently announced a plan to increase the cullet percentage to 25%. This 15% increase in cullet is expected to result in a 5-10% energy savings for the company.[186g]

The cost of meeting governmental particulate emission standards is high for the glass container industry and the use of waste glass in the manufacturing process considerably reduces air pollution.[160]

The decline in the 60s of a prior source of high-quality cullet, clear milk bottles and returnable bottles rejected in the washing process,[183/p. 51] has also contributed to the attractiveness of post-consumer cullet.

The fact that clean, color-sorted cullet can be substituted in large quantities for virgin raw materials (50-60% has already been successfully utilized), and that the glass container industry controls both the material process as well as product manufacture, offers substantial opportunities for increased recycling. This, combined with industry commitment to broadening recycling of post-consumer cullet, is a positive sign of increasing demand.

The implementation of container legislation in several states has also spurred recycling of glass, as steps are taken by container manufacturers and retailers to collect returned beverage containers. The growth of intermediate scrap processors, who process glass to container manufacturers' specifications, can be traced in part to container legislation as well as industry drives to collect glass containers. Glass container manufacturers need large quantities of good quality waste on a

regular basis, and the intermediate glass processors serve this need. In turn, assured of a steady, high quality supply, industry can gear up for increased cullet percentages in furnace mix.[186d]

There are several examples of positive industry response to these incentives. Glass Packaging Institute representatives in 1978 indicated that the demand for color-sorted, post-consumer cullet would expand as fast as the supply at current prices and 50% use of post-consumer cullet was seen as a reasonable long-term goal.[152/p. 36] More recently, a Glass Packaging Institute spokesman indicated that the industry goal was to increase recycling of post-consumer waste to 20% of production (in addition to current 15% in-plant cullet recycling). That would be a threefold increase from current post-consumer waste recyling, which is 5.5-6% of production. Industry statistics do show an increase in cullet recycling in recent years, as post-consumer glass recycling grew from .21% of production in 1970 to 5.5-6% in 1980.[54T] The last two years have shown a trend toward considerably increased recycling.

POST-CONSUMER GLASS RECYCLING[54T]
(% of Glass Container Production)

1970 - 0.21%	1976 - 3.40%
1971 - 1.62%	1977 - 3.16%
1972 - 2.89%	1978 - 3.16%
1973 - 2.21%	1979 - 4.6%
1974 - 2.27%	1980 - 5.5-6%
1975 - 2.48%	1990 - 20% (Industry Goal)

Other indicators of industry interest in post consumer cullet are the increase in intermediate glass processing centers and special incentive plans such as the one announced in late fall 1980 by Northwestern Glass, where a $10/ton year-end bonus for high volume recyclers was instituted in an effort to increase cullet volume in their Seattle plant by an additional 1950 tons (15% of production).[186g]

A number of factors have resulted in a particularly rapid increase of glass recycling in the Northeast, where an estimated 70% of U.S. community glass recycling occurred in 1979.[186d]

Air pollution and energy conservation are important considerations in the populous Northeast. In addition, the northeast has a large

number of bottle plants and municipal separate collection programs and three states with beverage container deposit laws.[160]

New Technologies: Source separated glass cullet, as noted earlier, currently provides almost all post-consumer cullet recycled by glass container manufacturers through mixing with virgin raw materials in the furnace batch.

Two promising types of mechanical systems have been studied and implemented on a pilot basis in recent years to separate reusable glass from mixed municipal waste.

One approach designed to recover glass is froth flotation. The froth flotation process yields a color-mixed cullet composed of tiny particles called "fines," a product with a particle size range of 20 mesh to 160 mesh. At the present time, this color-mixed portion cannot be further processed by color-sorting. Froth flotation testing is continuing; however the glass container industry specifications are difficult to meet.

A second approach is optical sorting, which requires larger particles of glass than "fines" (minimum 6mm). The process involves sorting out non-glass particles from the batch and then sorting clear glass from other colors, which are left mixed.[186]

The recovery of large quantities of cullet in the 80s by these methods in resource recovery plants is dependent upon the refinement of the technical processes for separating and upgrading the cullet. It is likely that source separation will continue to provide most cullet for container purposes, however, throughout the 1980s.

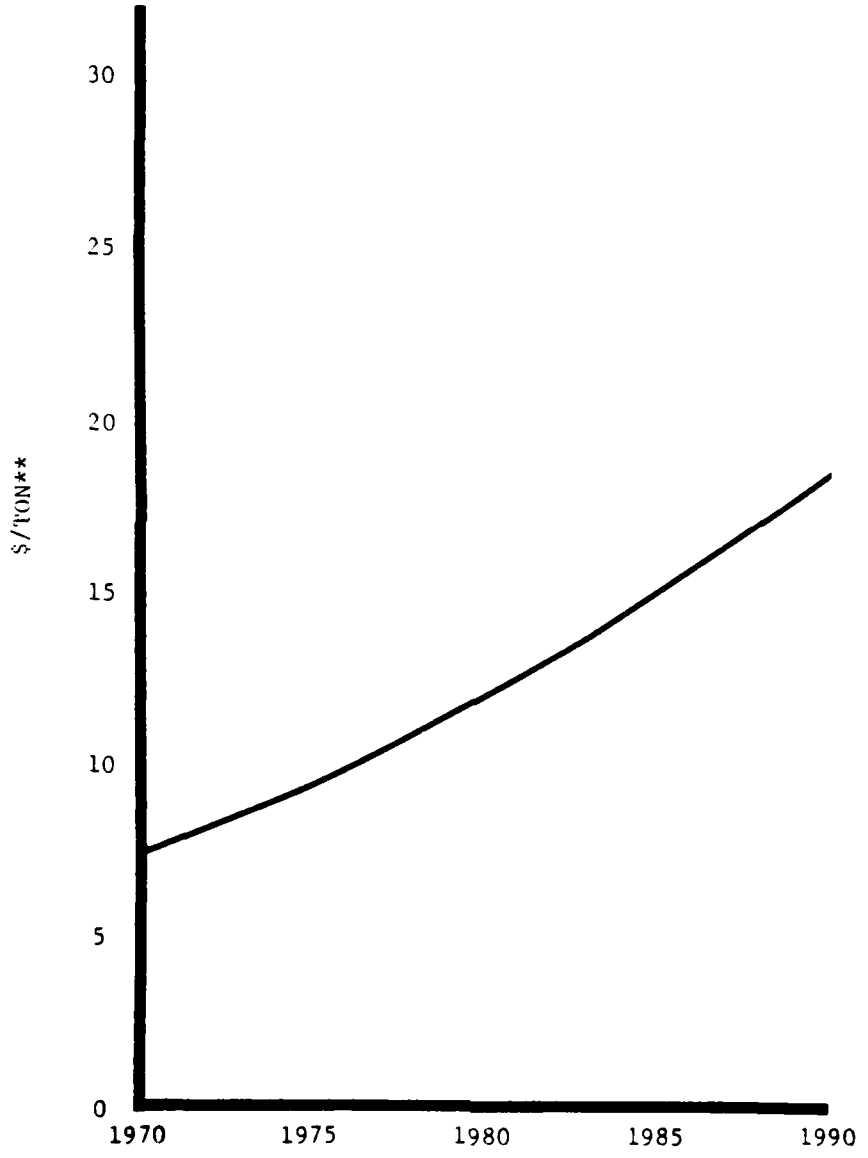
Elasticity of Glass: Currently most PCW glass in recovered through buy-back centers with some recovery coming from voluntary recycling and separate collection programs. Franklin Associates has developed estimates of annual glass recovery and ICF Incorporated determined a range of elasticities based on assumptions that increased recovery rates between 1975 and 1977 are attributed to real price increases (prices adjusted for inflation). The resultant elasticity is between 0.1 and 0.25 for buy-back centers and 0.1 to 13.4 for separate collection.

Buy-back operations appear to be so unprofitable at the current sorted cullet price of $30/ton delivered to the mill, very few new centers are starting operations. EPA officials believe cullet prices would have to be $60-65/ton before municipally operated programs would be viable.[152]

Separate collection programs contribute so little to the recovery volume (11,000 tons/year) elasticities are based on too few cases to have meaningful validity, hence the wide range between 0.1 and 13.4.

PRICE TRENDS

COLOR SORTED GLASS CULLET*



* f.o.b. Source (Excludes Freight to Manufacturer)
** Price Unadjusted for Inflation

At a supply elasticity of 0.1 at $15/ton increase in price to $45 from the present $30/ton price (color sorted and delivered) would increase volume in buy-back programs from 304,000 per year to 319,000 tons per year. At 0.25 supply elasticity the volume would increase to 342,000 tons/year. Therefore, significant price increases are required to increase supply substantially.

For separate collection of glass the high range elasticity of 13.4 at a $15/ton price increase could increase recovery from 11,000 tons/year to 84,700 tons/year. (All tonnage examples are based upon actual recovery volumes for 1976.)

3. Ferrous Metal

Markets - Current

Technology: Although containers represent only 0.5% of potentially recoverable ferrous scrap, they constitute the largest single category of ferrous waste in household refuse. Ferrous containers are also the least recycled ferrous product in our national inventory of ferrous reserves.

According to the U.S. Bureau of Mines, approximately 75% of household ferrous scrap is in the form of containers: 57.5% is tin-plated steel cans, 5% tin-free cans and 12.2% bi-metallic steel cans (aluminum tops and bottoms).[151]

The ferrous scrap industry is recovering much of the available scrap; this does not seriously impact the 75% of ferrous waste from household refuse - "tin cans."

In 1979, 54,609 million steel cans were shipped to wholesalers in the U.S., down from 60,503 in 1976, 59,903 in 1977 and 58,372 in 1978. Of the 54 1/2 billion steel cans shipped in 1979 only 3 1/2 billion were reclaimed for recycling.[191/p. 9] More than one billion dollars worth of steel cans were landfilled.

The principal reason cited for the low percentage of steel can recycling is the composite chemistry of the steel cans. Tin-plated steel cans are approximately 95.46% steel, 0.4% tin, 0.5% lead, 1.84% aluminum, and 1.8% organics. The tin aids in the rolling of the steel plate; the lead is solder for the seams; aluminum is often used for tops and bottoms to permit "easy" opening. These and the residuals (non-steel components) present serious metallurgical problems for most potential markets.[192/p. 5]

Markets: Ferrous metal, separated from waste prior to incineration and properly cleaned, offers a greater prospect for reclamation than incinerated cans. Incinerated cans do have a lower aluminum and lead

content but copper percentage is increased and tin forms a strong intermetallic bond with steel precluding detinning by present technology.

Potential markets for recovered, non-incinerated, tin-plated steel cans include:

1. steelmaking,
2. detinning,
3. copper precipitation,
4. ferroalloy production, and
5. iron foundries.

Recycling Applications

The use of scrap is traditional in steelmaking. About 46% of the industry's yearly scrap requirements - or approximately 33 million tons - comes from scrapped automobiles and appliances and the by-products of various steel manufacturing processes. The remainder is internally generated by the mills during steelmaking.

Although steel producers for many years occasionally charged used cans into their production furnaces, the practice did not present any serious technical problems because of the relatively small quantities involved. When nationwide emphasis on improving the environment and conserving resources made the recycling of used steel cans an important priority, controlled melting tests were undertaken to determine the most efficient method of recycling such cans into new steel.

At the present time, scrap cans are used as part of the charge to blast furnaces, electric furnaces, basic oxygen furnaces, open hearth furnaces, and mini-mills. The amount of scrap cans that may be used depends on the metallurgical requirements of the finished products.

By-Product Applications

Copper Precipitation: Ferrous scrap is used in a chemical process to recover copper from low grade ore. In this process acid is used to leach copper from mining overburden to yield a copper sulfate solution. Can scrap is then added to the solution to precipitate the copper.

Detinning: Detinning is a chemical process that removes the tin coating from steel cans rejected during manufacturing or from cans reclaimed from municipal solid waste. This recycled tin is then recovered electrolytically from its chemical bath. Detinning provides the only domestic source of this semi-precious metal.

The detinning market requires a very clean ferrous product with all surfaces available to chemical processing. Generally, to attain these specifications, the steel can scrap must go through a series of separation steps to eliminate contaminants. For example, at the Monroe

County, New York facility, ferrous scrap is first shredded with the bulk of the incoming MSW, then separated magnetically and conveyed to another magnet which divides the ferrous fraction into light (can scrap) and heavy components. The can scrap is further shredded and then goes through an additional magnetic separation step. A finely shredded, clean ferrous product results, which is suitable for the detinning market.

Ferroalloy Production: In this process iron is combined with controlled amounts of silicon and manganese. This material is then used as part of the "melt" for alloy steel or foundry casting.

Iron Foundries: Unlike steel mills, foundries turn out relatively few types of material. Grey iron, by far the largest product turned out by foundries, is amenable to a variable raw materials stream. Grey iron is a general term for lower grade cast iron used in applications such as pipe, grates and covers.

Economics

Market Viability: The market for reclaimed steel-based PCW is weak. Current applications in the copper precipitation industry and in steelmaking here and abroad are stable. The quantity of steel cans currently being reclaimed is approximately 3 1/2 billion per year from a total production of approximately 54.6 billion, or about 6 1/2% overall recovery, and approximately 3 1/2% PCW steel can recovery.

When the steel industry suffers reduced sales, demand for all scrap is adversely affected to a disproportionate degree. The category of tin-plated steel cans, among the least desirable steel scrap products, suffers most.

Prices: PCW can scrap prices are impacted severely by industry and government practice. Industry will pay 90% of #2 bundled scrap for detinned clean can scrap, currently about $45/ton. The specification for such product is included in Appendix F. The cost of detinning, at certain periods in market downturns, often exceeds the price of the processed scrap. At such times recovered can scrap cannot be sold without direct or indirect subsidies. Subsidies are usually in the form of voluntary collection of cans or municipal payment to remove can scrap from centralized solid waste resource recovery systems at a price equal to landfill disposal costs.

Economic Factors: Cans recovered from separate collection programs are highly elastic and range from 0.1 to 27.7. ICF Inc.[152] estimates that a price change from $40/ton to $55/ton for detinned, processed cans could increase recovery from 2,000 tons per year (1976) to as much as 20,000 tons/year.

Markets - Future

Energy: Blast furnaces and steel mills spent 3.5% of the value of finished products on energy in 1977. This compares favorably to 10% for aluminum, steel's nearest competitor for consumer containers.[131] However the aluminum industry can realize a 95% energy saving using recovered aluminum scrap while the steel industry can realize only 63% energy saving. The energy incentive for recycling is sufficiently greater in the aluminum industry to have spurred a rapid price increase for scrap aluminum cans while the steel industry has been less inclined to raise prices for steel can scrap based solely on energy savings.

Material and Industrial Practice

The AISI[191] estimates that in the next decade there may be a threefold increase in the availability of tin-plate post-consumer cans. A significant increase in centralized resource recovery systems will "spin off" an additional 8 billion tin cans per year through front-end separation systems.

However, mechanical separation of the ferrous fraction from mixed municipal waste often produces a tin scrap too contaminated with organic material to meet product specifications of detinners, copper precipitators or the steel industry. Cleaning and shredding of the recovered cans is required. This added processing may raise the cost of producing a usable scrap beyond the cost of hand sorted scrap and beyond the price industry will pay for tin can scrap. The added supply of mechanically separated can scrap may either be landfilled, or its cost of upgrading be subsidized by municipalities anxious to reduce landfill volume. Most supply growth will come from relatively expensive "source separation" programs with some intermediate processing. Therefore, the supply of can scrap is likely to experience a forced growth dependent upon subsidized mechanical and voluntary source separation recycling programs rather than from industry demand.

The impact of a threefold increase in the availability of tin plate will act to suppress the price of recovered tin cans. Only the steel industry and grey iron foundry industry offer a long-term growth market for tin cans. The export market, primarily to Asia, Spain and Italy, remain largely an unknown potential market for tin cans.

Legal Compliance

Present ICC regulations favor virgin material over secondary material. The large scrap sources on the East Coast have been at a severe economic disadvantage in shipping scrap to the West Coast copper precipitators. This has created higher prices on the West Coast for scrap

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TRENDS IN NAVY WASTE REDUCTION AND MATERIALS MARKETS.(U)
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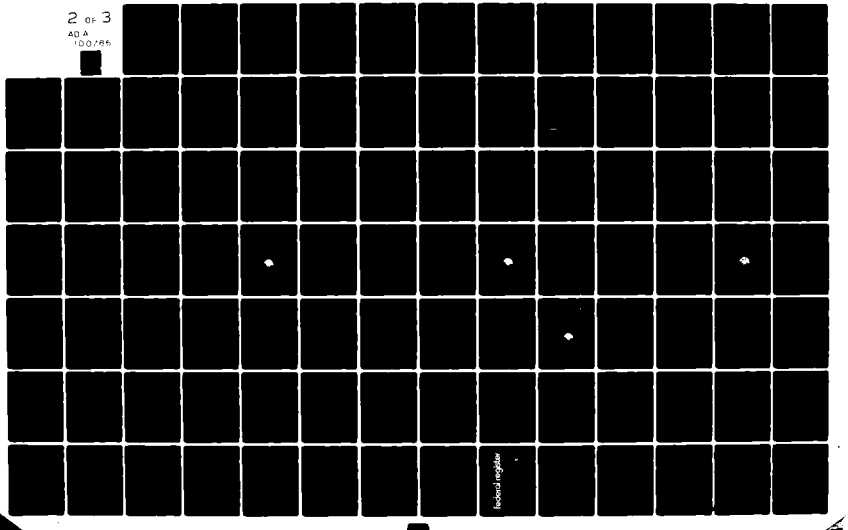


nearer the copper mines and lower prices on the East Coast to compensate for the high freight cost.

Regional Market Considerations

Prices paid for recovered post-consumer waste ferrous scrap are highly dependent on distance from markets and the needs of the individual markets.

The principal markets for PCW ferrous can scrap are the steel industry, copper industry, iron foundries and the ferroalloy industry.

Steel Industry: The steel industry will not accept a tin content greater than 0.3%. This requirement may be achievable without detinning if food and beverage cans are considered together. The tin content of 0.37 for food cans averaged with 0.25-% for beverage cans should meet this specification. ASTM E38 and ISIS 213 specification both require a 0.3% maximum tin content. Material must be baled to about 30 lbs/cu ft. After preparation and delivery to the steel mill PCW can scrap should be valued at about 90% of the #2 bundled scrap. The annual tonnage which could be accepted by blast furnaces and basic oxygen furnaces is approximately one million tons. Electric furnaces could accept an additional 200,000 tons per year of can scrap.[192] The steel industry is predominantly located in the Northeast and North Central states. Therefore, the Chicago and Pittsburgh #2 bundled prices are most relevant to the steel market. "Mini" electric furnaces, capable of accepting a 100% scrap charge are being built in increasing numbers in the Southeast and South Central states. This fastest-growing segment of the steel industry should improve the market in the "sunbelt" states in the 1980s.

Copper Industry: Detinned PCW cans can be used to precipitate copper from low grade "copper dumps." At its peak in 1972, the copper precipitation industry used about 50,000 tons of post-consumer scrap cans. While this material must be extensively prepared (detinned and shredded) the price per ton for the processed scrap reached $70/ton FOB mine site,[165] close to double the then prevailing price paid for similar scrap by the steel industry. West Coast scrap dealers benefitted from the lower transportation costs to the Rocky Mountain copper mines.

In recent years reduced production of U.S copper mines has adversely affected the value of West Coast can scrap. By early 1980 Los Angeles #2 bundle dealer prices were approximately $68/ton compared to $60/ton in Pittsburgh. New York #2 bundles, distant from both copper mines and steel plants were trading at only $30/ton.

Iron Foundries: Gray iron and ductile iron foundries can accept scrap with up to 0.35% tin. While hardness may increase slightly, the tin has had no effect on tensile strength.[196] This new market for PCW cans has just begun to be exploited. According to EPA[192/p. 81] as much as one million tons per year of PCW cans could be consumed by foundries before the end of this decade.

Because of the nature of the foundry industry, small plants geographically widely dispersed, the prices paid by this industry for PCW cans should not vary widely among the different regions in the U.S. Because detinning and shredding are not required by this market, it should provide an excellent profit to the PCW seller if an iron foundry is locally situated.

Ferroalloy Industry: There is a limited demand for PCW cans in this industry. One facility is currently using incinerated can scrap, and Union Carbide at Sheffield, Alabama "claims to be successfully charging 10% of its iron units in incinerator can scrap."[192] EPA estimates that if Union Carbide's practice were applied nationally, the potential for can scrap would be 50,000 tons/yr.

Due to the limited nature of the ferroally market no regional differences are now discernible.

Summary: The regional price differences, therefore, are dependent respectively upon the allowable tin content for the steel industry market located primarily in the North and North Central states; the surviving copper percipitation market on the West Coast; the growing iron foundry market widely dispersed through the nation; and the new "mini" steel mill industry market that is increasing most rapidly in the South and South Eastern regions. The copper precipitation market still offers the best prices (10% above #2 bundles) but is the least expanding market. While no price has been established, the steel industry pays about 90% of #2 bundles, and the foundry industry requires the least preparation.

New Technologies

Production: Energy price escalations favor reduced transportation of finished steel product to the market. As a result, relatively small electric furnaces (up to 600,000 tons per year capacity) are being constructed throughout the nation, near the end user market.[194] U.S. steel production from electric furnaces has increased from

4,911,000 tons in 1960 to 3,880,000 tons in 1980. The virtue of being nearer the end-user market is of even greater value to scrap dealers who have a market requiring a much reduced freight charge. The impact of the electric furnace and reduced copper precipitation scrap demand is evident in the narrowing of scrap can prices between the East Coast and West Coast. Grey iron foundries - small, widely dispersed and capable of using low quality scrap to produce low quality steel for reinforcing bars, counter weights and non-structural steel - have become a significant new market for undetinned cans. The studies indicate that as much as 10% of the metallics used by a foundry could consist of reclaimed cans and would create a market for more than 750,000 tons of this type of scrap. The availability of these localized markets will reduce the cost of shipping scrap over great distances.[191]

Recycling: Centralized resource recovery systems, designed primarily to convert solid waste to energy, often employ magnetic separation devices. These resource recovery systems can be expected to more than double the availability of PCW tin cans from 3 1/2 billion per year to 8 billion within the decade of 1980s. The additional supply should act to depress prices for recovered can scrap.

Elasticities

The elasticities of post-consumer waste (PCW) steel cans from buy-back programs, separate collection programs and centralized resource recovery systems have an overall weighted supply elasticity of from 0.4-0.8.[152] For example, the impact of a $15 per ton increase in the price paid for prepared PCW scrap would raise the quantity of recovered steel cans from 226,000 tons in 1976 to between 277,200 tons/year and 355,600 tons/year.

Impact of Quality on Volume

Purity and Specifications: The modern low tin content steel-based can (0.3% to 0.4%) now meets the new ASTM E38 specification (0.3% tin content; see Appendix F) for municipal ferrous scrap for iron and steel foundries and steel production with an inexpensive, high volume, caustic soda rinse. The scrap still must be cleaned and baled or shredded for user acceptance.

Quantity

As a result of these technological changes in tin can composition and in iron and steel manufacture the anticipated lack of market growth in the copper precipitation market may be replaced with the new markets in electric furnaces and grey iron foundries. The overall demand for post-consumer tin cans should increase significantly. The new resource recovery systems should, however, increase supply of scrap cans at a rate at least as great as the expanding market can absorb at present prices. Intermediate scrap processing should divert much of the added

scrap supply to the traditional scrap markets of the open hearth and basic oxygen furnace and to detinners.

Price Trends

Therefore, in the eighties, we should experience a two- to three-fold increase in the use of post-consumer tin cans with a modest price increase just greater than the anticipated 12% inflation rate and below the anticipated increase in virgin ore prices and finished raw steel prices.

Market Viability

The cost of producing tin can scrap will be largely subsidized by energy producing centralized resource recovery systems with front-end ferrous extraction equipment to improve refuse Btu values. Costs will further be subsidized by municipalities seeking to reduce increasing landfill costs by removal of marketable waste products and by voluntary source separation programs.

Costs for separation and preparation of marketable can scrap might well exceed $30 to $50 per ton (1980 dollars).

Costs, taking into account benefits of removing ferrous material from energy recovery combustors and from landfill, should be in the $5 to $15 per ton range in 1980 rising to over $25/ton by 1990 (unadjusted dollars).

Price Trends: Prices for clean, non-combusted, post-consumer tin plate cans, prepared for shipment by dealers, should range from $15 to $20 per ton in 1980 to $30 to $40/ton by 1990 (unadjusted dollars).

4. Non-Ferrous Metals - Aluminum

Aluminum scrap purchased by the aluminum industry falls into two basic categories, "old" and "new" purchased scrap. New purchased scrap is scrap material generated by industry in the manufacture of consumer or industrial products. More than 90% of generated new scrap is recycled. Old purchased scrap is the aluminum content retrieved from all types of post-consumer wastes and is the type with which this report is primarily concerned. These discarded aluminum products consist primarily of aluminum cans, and also include such items as aluminum foil, utensils, siding, awnings, and other building products.

There are three complementary methods of recovering the aluminum scrap entering the solid waste stream. The first and most successful method is consumer recycling, in which there is collection of a single product or type of product such as the aluminum can. This source segregation method has been primarily responsible for the dramatic increase of aluminum scrap recycling since the late 60s.

The recovery of old aluminum scrap as a by-product from a stream of processed solid waste has potential but is still a very small proportion of the total increase in aluminum scrap recycling.

Recovery of aluminum from automobile shredding operations is also a small but growing proportion of the old scrap recycled by the secondary aluminum industry, as automobiles contain larger percentages of aluminum. This aluminum does not, however, appear in municipal solid waste statistics.

Reynolds' consumer can recycling programs are also reaching out to the military, and a Reynolds spokesman has indicated interest in expanding this aspect of their can reclamation program. Reynolds currently has on-base recycling programs at 15 military bases (Army/Air Force). In each case Reynolds has signed a concessionaire's agreement with the Army/Air Force Exchange whereby a Reynolds mobile unit comes onto the base and base personnel bring aluminum cans for payment at the current Reynolds public price. At Fort Campbell, Kentucky the mobile unit, which comes on base two half-days per week, collects 30,000 pounds of aluminum cans/scrap per month. Reynolds then pays the Exchange a 3¢/pound commission on the amount collected each month.[89T]

There are three main consumers of new and old purchased scrap. The major consumers are secondary aluminum producers, who utilize old and new scrap to produce secondary aluminum alloys to specification. Secondary smelters pretreat and upgrade aluminum scrap by removing contaminants and diluting the alloy contents to acceptable levels. These producers are located near sources of scrap and markets. Primary producers and non-integrated producers of wrought alloy products also utilize aluminum scrap as a portion of a furnace charge, the remainder being primary alumimum ingot.[170]

CONSUMERS OF RECYCLED ALUMINUM[172]
NEW AND OLD PURCHASED SCRAP

Secondary Aluminum Producers	55%
Non-Integrated Fabricators	20%
Primary Aluminum Producers	25%

While secondary aluminum producers are the major consumers of aluminum scrap, most aluminum cans are purchased by primary producers through the types of source separation consumer programs described earlier.

CONSUMPTION OF ALUMINUM SCRAP BY TYPE[138]
(per 1,000 Short Tons)

	Secondary Smelters	Primary Producers & Others	Total
Old Scrap			
Castings, Sheet and Clippings	121	35	156
Aluminum Cans	8	101	109
Other	30	17	47
Sweated Pig	82	17	99
	241	170	411

There is a strong demand for old aluminum scrap, which has a relatively high scrap value compared to other scrap metals. Energy cost of aluminum production is one of the factors making old aluminum scrap attractive to the aluminum industry. Energy requirements to make aluminum from recycled aluminum as opposed to bauxite are reduced by 95% - a significant cost savings. Recycled aluminum enters the aluminum-making process at a point that cuts off the mining operation, the refining, and the electrolyte reduction process needed to form aluminum from bauxite, the richest aluminum ore, which is usually imported to the U.S. A facility to remelt recycled aluminum can be built for one tenth of the cost, and in one half the time, of new aluminum refining and smelting equipment.[171]

Price Trends

The price paid the public per pound of aluminum has risen steadily, more than doubling since 1968, and prices paid to scrap processors for truck or railroad car loads, shredded or baled, are considerably higher. Reynolds paid 10¢/lb when it started its first consumer can reclamation program in 1968. The price was raised to 15¢/lb in 1974, 17¢/lb in 1977, 20¢/lb in 1979 and 23¢/lb in 1980. This standard price paid across the country is adjusted upward in certain market areas to match the going market price in that area.[78T] The price of 99.5% virgin ingot aluminum at New York, according to quotations published daily in American Metal Market, has risen even more sharply since January 1968, when it was 25¢/lb, to December 1978, when it reached 66.25¢/lb.

Impact of Quality or Value

The origin specifications for old can stock, as described by the National Association of Recycling Industries, state that old can stock "shall consist of clean old aluminum cans, decorated or clear, free of iron, dirt, liquid and/or other foreign contamination." This applies to consumer separated aluminum beverage cans, for which national prices were quoted earlier. When these same cans are shredded, or flattened and baled, and delivered by the truck or railroad carload, the price increases considerably. Origin specifications for all types of non-ferrous scrap are included in Appendix F.

In contrast, guideline municipal aluminum scrap specifications shown in Table II-A-13, spell out the composition and related physical properties of acceptable aluminum scrap from municipal solid waste. These specifications cover aluminum for use by the following industries:

- o Secondary Aluminum Smelters
- o Primary Aluminum Producers
- o Aluminum Scrap Dealers
- o Iron and Steel Industry
- o Foundries
- o Non-Integrated Aluminum Producers, and
- o Independent Aluminum Fabricators.

Markets - Future

Industrial Practices: Aluminum companies are taking a number of steps to encourage return of a higher percentage of post-consumer cans. Public collection programs and collection services to beverage distributors are increasing; advertising emphasizes the advantages to distributors of selling back used aluminum cans; and aluminum companies are setting up "tolling" agreements with their large can-making customers guaranteeing them a pound of aluminum sheet for every pound of can scrap or recycled cans received.[171e] Their aggressive search for additional post-consumer aluminum cans has increased competition among users of scrap aluminum, assuring a strong market through the 80s. As the industry efforts for reclaiming ever higher amounts of aluminum cans prove more successful, efforts are being made to expand the amount of non-can aluminum scrap as well. Scrap currently represents 12% of Reynolds' total primary capacity, and according to a company spokesman, Reynolds' goal is to double that volume of scrap to 24% of primary capacity by 1985. Cans represent 90% of old can scrap volume today at Reynolds, and the company has recently begun buying castings (pots and pans, lawnmower housings, barbecue grills, etc.). As the total amount of scrap reclaimed grows, Reynolds plans to also increase the ratio of non-can scrap to reclaimed cans from 10%:90% to 20%:80% during the same period of 1980-1985.[89T]

Efforts to reduce per-unit energy requirements of aluminum production will continue, both through improved primary production technology and the use of recycled aluminum which reduces energy use by 95%.

Industry Expansion Projections

1. DOC 1980 U.S. Industrial Outlook Projections:

   i. Industry will grow at a compound annual rate of 5% through 1984.

   ii. 1984 shipments should be 18.7 billion pounds.

   iii. The beverage industry share of the can market will reach 75% in 1984.

2. Plastics World article (1/80) on London Financial Times prediction:

   i. 4-6% average annual expansion of industry during 1980-1990 (reduced from historic 8% growth rate) because of reduced smelting capacity vs. demand for aluminum.

   ii. Aluminum prices will rise steadily due to energy costs.

   iii. Aluminum supplies will not keep up with growth of world demand through 1985.

   iv. Tight supply may continue through the 80s as foreign countries use larger quantities of embossed and painted aluminum sheet.

3. DOE (3/80) Study on Recycling Targets for 1987, by A.D. Little:

   Using 1978 as the base year, A.D. Little set targets for total scrap recovery, as percent of production, at 34.7% and total scrap metallic recovery at 29.3% of total production.

Several trends over recent years are expected to continue through the 80s. As a percentage of total supply of aluminum, recovered old and new scrap has increased from 18% in the late 60s and 20% in 1977.[172] By 1979 the combined total had reached 23% of total supply.[131] Since the 90% recycling of new scrap has remained constant during this period, the increased recycling has been due to the recycling of "old" scrap, primarily through the recovery of old aluminum cans. In 1970 the ratio of new vs. old scrap was 80%:20%. By 1979 the ratio had shifted to 65.5% to 34.5%.[101/p. 41]

Aluminum Elasticities

Aluminum appears to be highly price-elastic. The price paid for aluminum rose from 13¢/lb in 1973 to 28¢/lb in 1977 (the real price rise after adjustment for inflation was 6.4¢). The recovery rate went from 3.4% to 11%. This recovery rate increase indicates a a supply elasticity of 4.3.

5. Plastics

Markets - Current

Industrial scrap generated in the manufacture of resins and plastic items is routinely recycled, both directly within the in-plant manufacturing process of resin and plastic items and after collection and upgrading by scrap processors. When the resin producer or fabricator does not have facilities for in-plant recycling or when scrap is too contaminated to be combined with virgin resin and directly reintroduced into the manufacturing process, the scrap is sold to reprocessors. The reprocessor separates scrap by type, removes contaminants and may also alter the characteristics of the scrap resin by blending different lots and adding plasticizers. The reprocessor then sells the reprocessed scrap, by type, to fabricators who either mix the waste with virgin resins or manufacture a product solely from the waste scrap.[114] An estimated 10% of the raw material used to make plastics in 1970 was recycled industrial scrap.[153]

In contrast, relatively small quantities of the post-consumer plastic entering the waste stream have been recycled up to now, and with few exceptions this situation is unlikely to change in the 1980s.

In theory, the 80% thermoplastic portion of the plastic waste stream, those that can be remelted and reformed, is recyclable. In practice it is extremely difficult due to the very nature of plastics themselves and plastic manufacturing processes.

Plastics are a family of synthetic materials, each member of which has its own special properties. The overall properties of a plastic are a result of the combined properties of all it molecules, such as the different sizes, their chemical structure and shape and their ability to crystalize.[114]

The 42 different types of plastics[189] can be changed in infinite ways. Additive such as lubricants, antioxidants, antistats, blowing agents, colorants, fluorine retardants, organic peroxides, plasticizers and ultraviolet stabilizers can be added to plastic resins to make them suitable for manufacturing a particular product. It is the very versatility of plastic material that has contributed in a major way to its phenomenal growth in competition with metal, glass, paper and wood. But these same qualities limit the prospects for recycling plastics from post-consumer waste streams because it is almost impossible to economically collect, separate, sort and grade a heterogeneous group of

plastics through the type of source separation programs used to reclaim, for example, newspapers, glass bottles or aluminum cans. In contrast, industrial waste purchased in bulk by reprocessors has a uniformity which make reclamation more economical and the reclaimed product more competitive with virgin resins.

Even the recycling of industrial wastes by reprocessors was hindered during the sixties and early seventies due to the trend in decreased selling prices of the basic resins. For example, the average price of the maker thermoplastic, LDPE, and offgrade LDPE dropped considerably in price. In contrast secondary scrap resin was only 3 cents less per pound than offgrade in 1961 and one cent less in 1971.[114] While technology was reducing the cost per pound of virgin resins, rising labor and distribution costs for reprocessors made secondary resins less competitive in price. As plastic feedstock prices increased in the 70s, the cost of virgin resins increased and secondary resins became more competitive.

The technological and economic feasibility of plastic recovery from municipal waste resource recovery systems is even more uncertain. Although some work has been performed on mechanical separators for plastics recovery from municipal solid waste, the expense involved in the recovery process and the accompanying reduction in structural characteristics due to heat stress and contamination has made potential users wary of purchasing recovered plastics. Moreover, no techniques are currently available for separating mixed plastics once they are recovered. No process technology is available for the purification and upgrading of contaminated, degraded or colored plastics.

The greatest potential value for plastics appears to be in a heat-recovered process. Plastics found in the waste stream have a 15,000 to 16,000 Btu value per pound, the highest of any material in the waste stream. As the proportion of plastics and paper in solid waste increases, so will the Btu value of municipal solid waste. In the event that heat recovery becomes a more present possibility in a resource recovery program, plastics will become increasingly important. One word of caution: PVC may present a problem during combustion since a product of its combustion is chlorine which may form hydrochloric acid. Hence, boiler corrosion is enhanced by the presence of large amounts of PVC in the waste.

Two primary factors limit the potential for source separation of plastics from the waste stream. First, plastics must be separated into individual types. Secondly, they must be freed of contaminants to the degree that properties and performance standards of the recycled product will be sufficient to the intended end product. Even when it is possible to collect a homogeneous group of plastics suitable for recycling into some end product, the economics of collection, preparation and transportation to a buyer may not be favorable.

Within those constraints, however, it is possible to profitably recycle some post-consumer waste. A large generator of plastic waste, upon review of the types of plastic products in their waste stream, may find exceptions to the generally poor outlook for post-consumer plastics recycling.

Western Electric and Bell Labs, for example, have developed processing techniques for large scale recycling of junk ABS telephones formerly discarded in landfills. The recycled material is made into a variety of products, including pallets, trays, and cable terminal panels.[138]

The most dramatic example of post-consumer plastic recycling has occurred in the past two years and involves the recycling of PET plastic beverage containers. A number of conditions have combined to create a high demand for those containers for recycling into a variety of end products. This demand is likely to meet and even outpace combined supply for bottle manufacturers and source separated post-consumer waste throughout the 80s.[190]

The overwhelming inroads of two-liter plastic PET bottles in the soft drink beverage market has created a steady stream of an easily identified product. In states where container legislation requires a deposit on beverage containers, high return rates guarantee a high volume of homogeneous PET waste and the primary source of recycled post-consumer PET plastic is recycled from states with such legislation[190], with returns ranging as high as 95%.[190]

Other potential sources of supply include industry-sponsored recycling centers such as the local Beverage Industry Recycling Program in Arizona and Maryland and voluntary recycling programs in non-deposit states.[190c]

Economics have also begun to favor PET recycling, as virgin resin prices have spiraled with feedstock price increases. In early 1980, granulated PET bottles with high contamination (caps, paper labels, base cups) were selling for 3¢ a pound and more. Regrind with low levels of contamination sold for up to 20¢ a pound. In comparison, virgin bottle-grade PET resin was selling for about 60¢ per pound.

The properties of reclaimed PET do not differ significantly from those of virgin PET, except for color. The color from green PET bottles, if mixed with clear PET, precludes manufacture of a clear or colorless product. The possibility of some contaminants remaining even after upgrading also precludes food contact use.

The technology for reclaiming PET containers is growing as industry interest increases and the end use depends on the technology used. Material Reclamation Systems, formed by DuPont in 1972 to establish and profitably manage reclamation businesses which reclaim industrial

by-products, waste and used packaging material, has established a program to reclaim PET. Using technology developed by the company, DuPont's system will reduce PET chemically to its key components for use within the company, a large user of polyester.[190c]

The Goodyear Tire and Rubber Company, a major supplier of PET resin to the bottle industry, has also been developing PET bottle recycle technology. Unlike DuPont's system, Goodyear's system does not include reduction of the PET to its key components, but uses grinders and air and water separators to segregate the various components of the bottles according to their different specific gravities.[190d] The company is making its technology available to bottle manufacturers, distributors, recyclers and other potential users. The product resulting from this system is suitable for processing into fibers, molded auto parts and machine housings, building and insulation products, and various other reinforced and unreinforced thermoplastic polyester products.[190b]

Eastman Chemical Products' technology produces unsaturated polyester for reinforced plastics.

Information about PET bottle reclamation and markets can be obtained from:

1. The E.I. DuPont de Nemours and Company, Inc.
   Materials Reclamation Systems
   Wilmington, Delaware 19898

2. Wellman Industries, Inc.
   Johnsonville, South Carolina 29555

3. Pure Tech Industries
   4 Barnett Road
   Pine Brook, New Jersey 07058

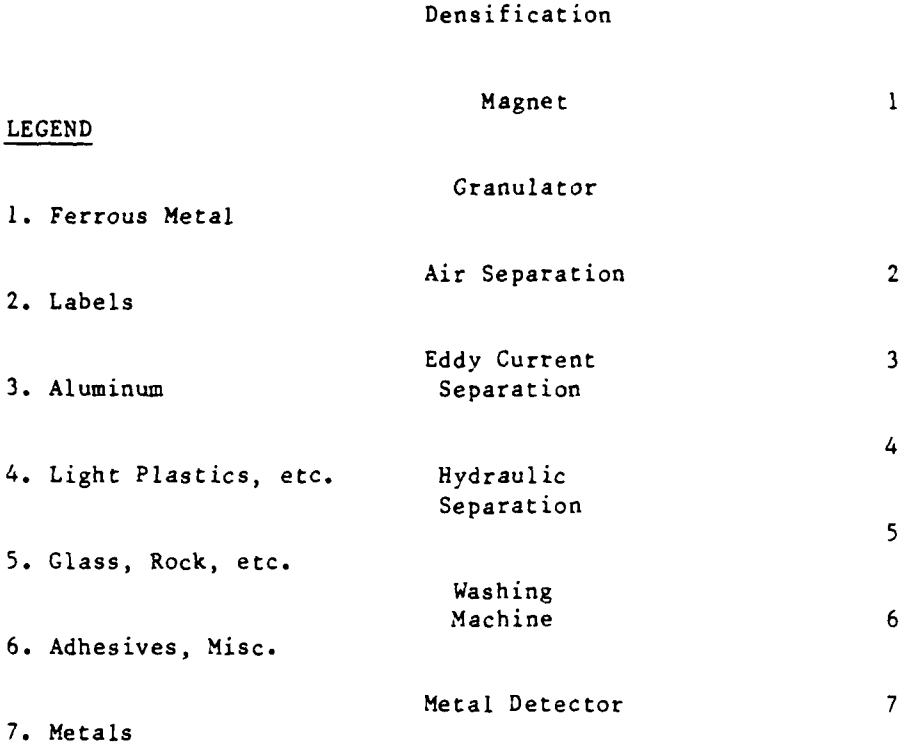
4. The Goodyear Tire and Rubber Company
   Akron, Ohio 44316

The future of secondary markets for reclaimed PET bottles is bolstered by increasing PET reclamation technology and rising virgin resin prices, with current demand for PET bottles exceeding supply. Limitations on the potential for expansion of the industry, in contrast, are linked to concerns about capital investments in light of increasing competition for what is now a limited scrap supply.

Markets do exist for other plastics reclaimed from the waste stream given the right conditions. If a large volume of a similar type of plastic material could be generated by a facility on a regular basis, and if the material were uncontaminated by other materials, it is likely that a scrap processor who purchases industrial plastic scrap would also purchase the segregated post-consumer material.

GOODYEAR RECLAMATION PROCESS[190e]

Post Consumer PET Bottles



LEGEND

1. Ferrous Metal
2. Labels
3. Aluminum
4. Light Plastics, etc.
5. Glass, Rock, etc.
6. Adhesives, Misc.
7. Metals

POLYESTER FLAKE

B. RECOVERABLE WASTE PROJECTIONS

1. Paper

Growth of Current Applications

The largest single use of post-consumer wastepaper is in the production of paperboard for boxes, cartons and fiber cans. Their use accounted for about 61% of the total demand for post-consumer wastepaper in 1976. Paperboard can be made from 100% recycled materials and from any grade of post-consumer wastepaper. Over half of the waste paper used in paperboard is corrugated paper.

The second largest use is in construction paper (15% of total recycling) and third largest use is in newsprint production (4% of total recycling in 1976).

Tissue paper and cellulose insulation each accounts for about 3% of the demand for post-consumer wastepaper in 1976. The export market accounts for 13% of all paper recycled.

The boxboard segment of the paper industry relies heavily on imports of virgin fiber, principally from Canada. Canadian pulp prices are increasing at a rate greater than the U.S. inflation rate and will continue to increase in price in the 1980s as forest land decreases and clear-cutting techniques are phased out in favor of more expensive planned forestry.

During this same 10-year period, containerboard and paperboard are expected to grow from 62.4 million tons per year in 1980 to 77.4 million tons per year in 1990.[130]

Therefore, paper production will increasingly rely on wastepaper of all grades to produce corrugated and boxboard containers.

According to a 1979 report by ICF Incorporated by Washington, D.C., commissioned by EPA and the Council on Environmental Quality, recycling rates will reflect the added domestic demand for wastepaper feedstock. ICF calculated that PCW wastepaper will experience an increase in the rate of recycling from 22% in 1976 to 26% in 1985. Factoring in the rapid increase in the growth of newsprint for feedstock, Gordian projects the overall PCW paper recycling rate to reach 35% by 1990. It should be noted that DOE and industry projections for the percentage increase in the use of waste paper include both industry (in-house waste) and PCW. Currently most industry waste is being recycled. Therefore any significant growth in the rate of recycling will come from post-consumer waste and will be reflected in a PCW recycling rate greater than the overall growth rate of wastepaper recycling. The overall recycling rate for all wastepaper (industry and PCW) is projected by DOE to reach 26% by 1990.

2. Glass

Growth of Current Applications

The glass manufacturing industry is technically capable of producing container glass exclusively from PCW glass containers. One company, the Glass Container Corp., has made glass with 100% post-consumer cullet in its Dayville, Connecticut plant and regularly uses post-consumer cullet for 50-60% of its raw material.[152] Although industry wide approximately 21% of glass feedstock is color-sorted cullet, 15% glass manufacturing waste and 5% reclaimed PCW.

New Applications

Post-consumer glass has begun to be used in the glass wool insulation industry. The amount used is currently insignificant. Glass wool manufacturers are using their own internally-generated cullet but so far have avoided PCW because of problems of consistency, color contamination and the difficulty of assuring a large stable supply. As energy costs escalate it is reasonable to anticipate greater use of PCW cullet in this industry although no projections can be accurately made at this time.

The steep increase in energy-related costs has induced the industry to seek clean, color-sorted glass waste. As a result of its lower melting temperature and reduced wear on furnace refractors, the industry has been willing to pay increasingly higher prices for cullet. In 1970, the industry paid $10/ton, in 1975 $20/ton, and in 1980 $30/ton of clean, color sorted cullet delivered to the manufacturer. Factoring out freight costs for delivery of cullet, the prices paid increased from $7.50/ton in 1970 to $11.40/ton in 1980. This price increase was sufficient to increase the percentage of post-consumer glass use from 0.21% in 1970 to 6% in 1980.[54T]

In the decade of the 1980s prices are anticipated to increase to $20/ton (exclusive of freight charges) equivalent to $60/ton delivered to the manufacturer. At this price, the rate of PCW glass recycling should increase from 3.5% in 1976, to 8% in 1980, to 18-20% in 1990.

3. Ferrous Metals

Growth of Current Applications

Steel is produced essentially by three types of furnaces: the basic oxygen furnace (BOF), the open hearth (OH) and the electric furnace (EF). The electric furnace is able to accept up to 100% scrap charge but is generally charged at 98% scrap; the open hearth can accept up to 50% scrap but is generally charged at about 41% scrap, and the basic oxygen furnace can accept approximately 30% scrap charge.

Although the output of raw steel in the U.S. has increased by only 3.5 million tons per year from 1970 to 1979 the composition of steel manufacturing plants has changed dramatically away from the open hearth to the basic oxygen and electric furnaces.

YEAR - 1970

Type of Furnace	% of Scrap Charged	Scrap Consumption	Steel Production	Steel Production
BOF	30%	21.1 mil	48%	63.3 mil
OH	41%	22.0 mil	37%	48.0 mil
EF	98%	21.2 mil	15%	20.2 mil
		64.3 mil		131.5 mil

YEAR - 1979

BOF	30%	25.11 mil	62%	83.7 mil
OH	41%	8.86 mil	16%	21.6 mil
EF	98%	29.11 mil	22%	29.7 mil
		64.3 mil		131.5 mil

From this chart it can be seen that steel output increased moderately but overall scrap use declined moderately from 1970 to 1979. The replacement of open hearth furnaces with BOF furnaces caused a reduction in scrap requirements which were almost compensated for by increased electric furnace use. During this period the percentage of scrap reclaimed from post-consumer waste increased from 1.2% in 1970 to 3.6% in 1979. The principal cause of the increase in post-consumer ferrous metals is the greater use of the electric furnace. The EF relies heavily on purchased scrap, while the other two furnaces are dependent on home (inhouse) scrap.

On an industry-wide basis, it is estimated that 60% of all scrap consumed is home scrap, 16% purchased prompt industrial and 24% purchased obsolete scrap. Purchased scrap requirements in electric furnace shops vary considerably depending upon the type of product being

produced and whether continuous castings or ingots are cast. For example, electric furnace shops producing reinforcing bars have very little home scrap and may purchase as much as 95% of their requirements. On the other hand, electric furnace shops producing plate steels generate a considerable amount of scrap and may purchase only 65% of the requirements. Scrap purchases for facilities producing forgings are even less.

The EF segment of the industry is experiencing a rapid increase in use which suggests a greatly increased demand for purchased scrap. See chart and accompanying graph, below.

ELECTRIC FURNACE STEEL PRODUCTION
IN SELECTED YEARS
(net tons, 000s)

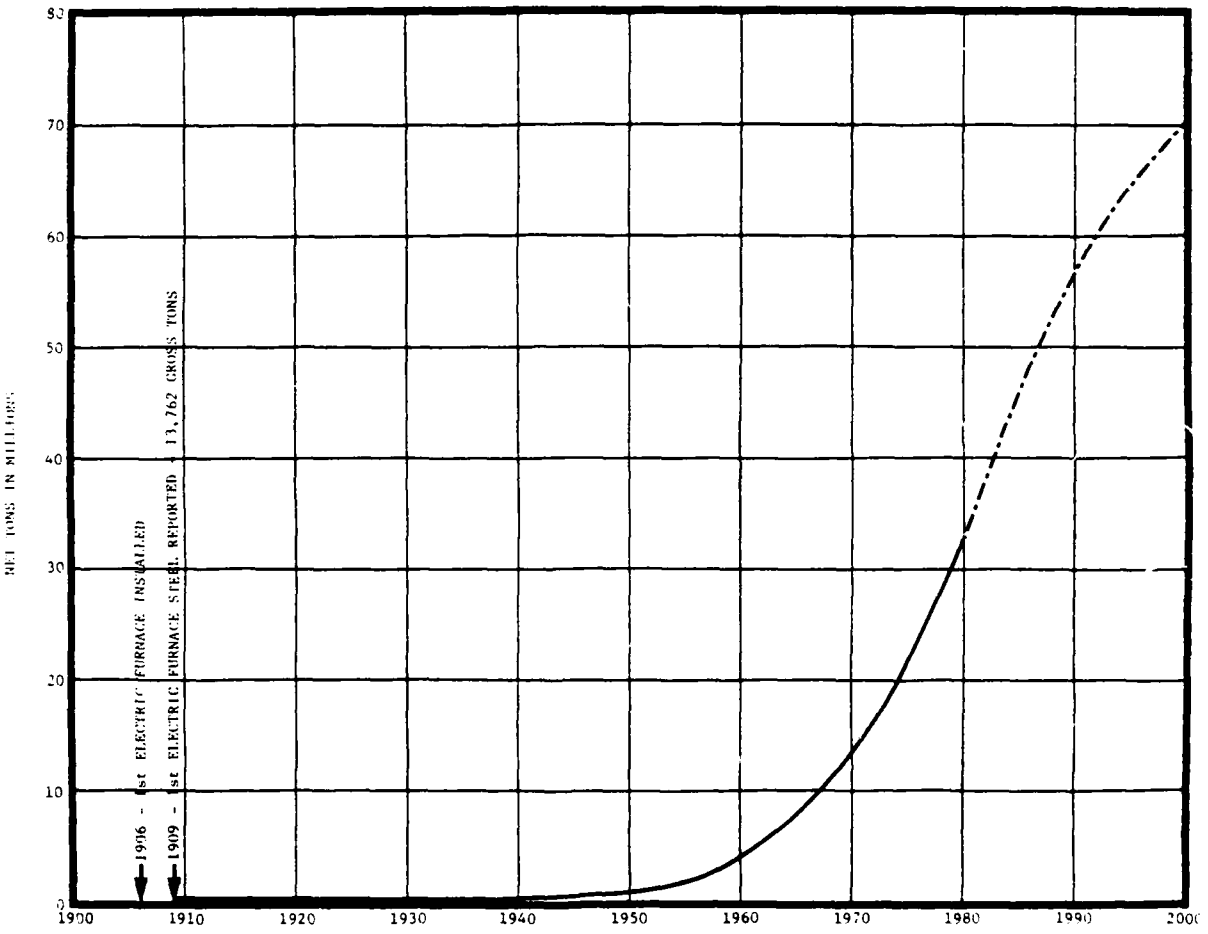
	Japan		United States	
	Tons	% Total Steel	Tons	% Total Steel
1945	76	5	3,456	4
1950	828	16	6.039	6
1955	1,306	13	8,050	7
1960	4,911	20	8,379	8
1965	9,205	20	13,804	10
1970	17,182	16.7	20,162	15.3
1971	17,191	17.6	20,941	17.4
1972	19,812	18.6	23,721	17.8
1973	23,556	17.9	27,759	18.4
1974	22,980	17.8	26,669	19.7
1975	18,460	16.4	22,680	19.4
1976	22,024	18.6	24,612	19.2
1977	21,558	19.1	27,882	22.2
1978	24,530	21.9	32,237	23.5
1979	28,930	21.9	33,900	24.8
1980	33,880(E)	26.8(E)	32,000(E)	26.7(E)

(E) = extrapolated from 1st Quarter figures.

The segment of the scrap industry that has been least exploited is the light ferrous fraction of post-consumer waste, e.g., "tin" cans. Added demand for purchased scrap created by electric furnaces will come in part from post-consumer waste cans that have been detinned. The future demand for post-consumer steel in detinners will depend largely on modifications in their caustic soda processes to reduce costs for high volume, low level, tin removal.

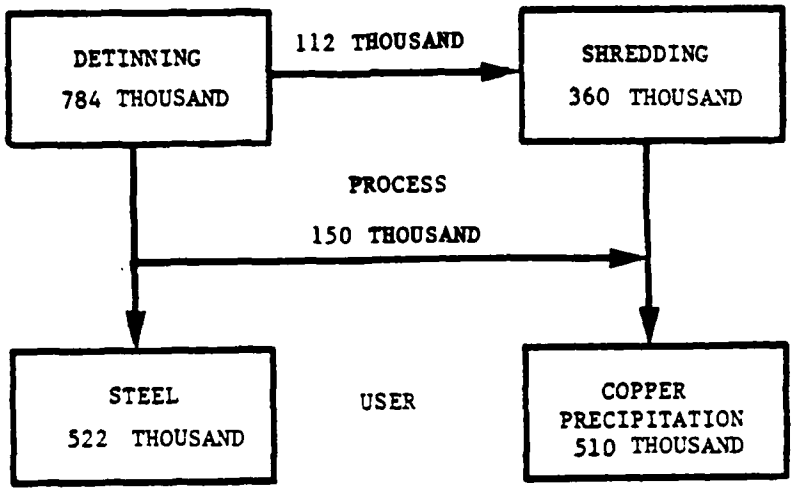
As an estimate of the baseline amounts of detinning demand it is assumed that at present prices ($20-$30/ton) by 1985 every detinnery in

ELECTRIC FURNACE STEELMAKING IN
THE UNITED STATES THOUGHOUT THE 20TH CENTURY



metropolitan areas with a population of over 1 million will be accepting the steel output from waste recovery plants. This amounts to a demand of 373,766 tons/year (compared to the estimate of about 150,000 tons/year for 1976).

The optimistic estimate of the effect of a price incentive is developed assuming that a $20/ton incentive would be sufficient to induce detinnery firms to expand to all metropolitan areas of more than one million people.



The total detinnery demand for post-consumer packaging scrap under these conditions is estimated to be 1,602,000 tons/year.[152]

The $20/ton added value would raise the price of clean post-consumer cans from the present price of approximately $20/ton FOB the scrap dealer in 1980 to about $40/ton by 1990.

4. Non-Ferrous Metals - Aluminum

Aluminum use has grown at an average rate of 8% since 1946. It is used for building and construction materials, containers and transportation. Aluminum cans account for about 18% of all aluminum production. Post-consumer waste contains very little aluminum other than cans (87% of all non-durable aluminum post-consumer waste is cans).[181] Aluminum beverage cans are growing in use at approximately 5% per year and should achieve a market penetration of about 75% by 1984.[131] The major factor inhibiting even greater aluminum use is the high energy cost for aluminum production. As a result, the industry has turned increasingly to recycled cans as replacement feedstock for smelted bauxite. Production of new cans from old cans reduces energy costs by about 95%.[131]

New uses for aluminum are being developed by the transportation industry to lighten vehicle weight, thereby reducing fuel costs. However, due to the alloy content of aluminum cans almost all recovered cans are used in the manufacture of new cans. Therefore, only increased sales for new aluminum cans and increased energy costs would significantly increase the need for PCW aluminum cans.

Increased Markets

Aluminum beverage cans currently have approximately 63% market share,[173] which should increase to 75%[131] by 1984 and remain at that level market share through 1990. Overall growth in beverage containers from 1984 through 1990 should be approximately 5% per year. The demand for aluminum feedstock for beverage cans should grow at about 5%/year through 1984 and at about 3%/year from 1984 through 1990. However, the makeup of aluminum feedstock is changing at a far more dramatic pace as a result of the strong influence of energy costs on the aluminum industry.

Energy Costs

Energy costs account for 15%[131] of primary aluminum production. Producing a can from PCW aluminum cans permits a 95% energy savings. As a result of the five-fold increase in energy use since 1974, the industry has actively encouraged recycling of old cans. In 1978 25% of all cans produced were reclaimed - equivalent to 8 billion cans, compared to 1.2 billion in 1972 and 6.4 billion in 1977.

The demand for PCW aluminum cans is reflected in prices paid to recyclers. In 1974 the industry paid $250/ton at the mill; in 1978, $500/ton; in 1979, $580/ton. Recycling centers have increased in number from 100 in 1970 to 2,300 in 1978.[152]

Growth In Recovery Rates

Based on anticipated energy cost increases, the demand for PCW aluminum cans as feedstock should continue to increase dramatically to 30-40% by 1985. However, the reduced growth rate of aluminum cans from 1985 to 1990 combined with the increasing incremental cost of reclaiming greater than 40% of PCW aluminum cans should dampen growth in recovery rates. By 1990, 45% to 50% PCW aluminum can recovery may be expected, almost a doubling from the present 25% rate.

C. NAVY RESOURCE RECOVERY POTENTIAL

1. Value of the Constituency

The qualities of recoverable components of the Navy waste stream have been identified and projected to 1990 in Section I-D-7 of this report. The numbers shown on a tons per day basis in that section are converted to tons/year below:

TONS PER YEAR
OF RECOVERABLE NAVY WASTE CONSTITUENTS

	1980	1985	1990
Paper	487,713	522,972	557,136
Glass	985	912	985
Metals	5,438	5,803	4,343

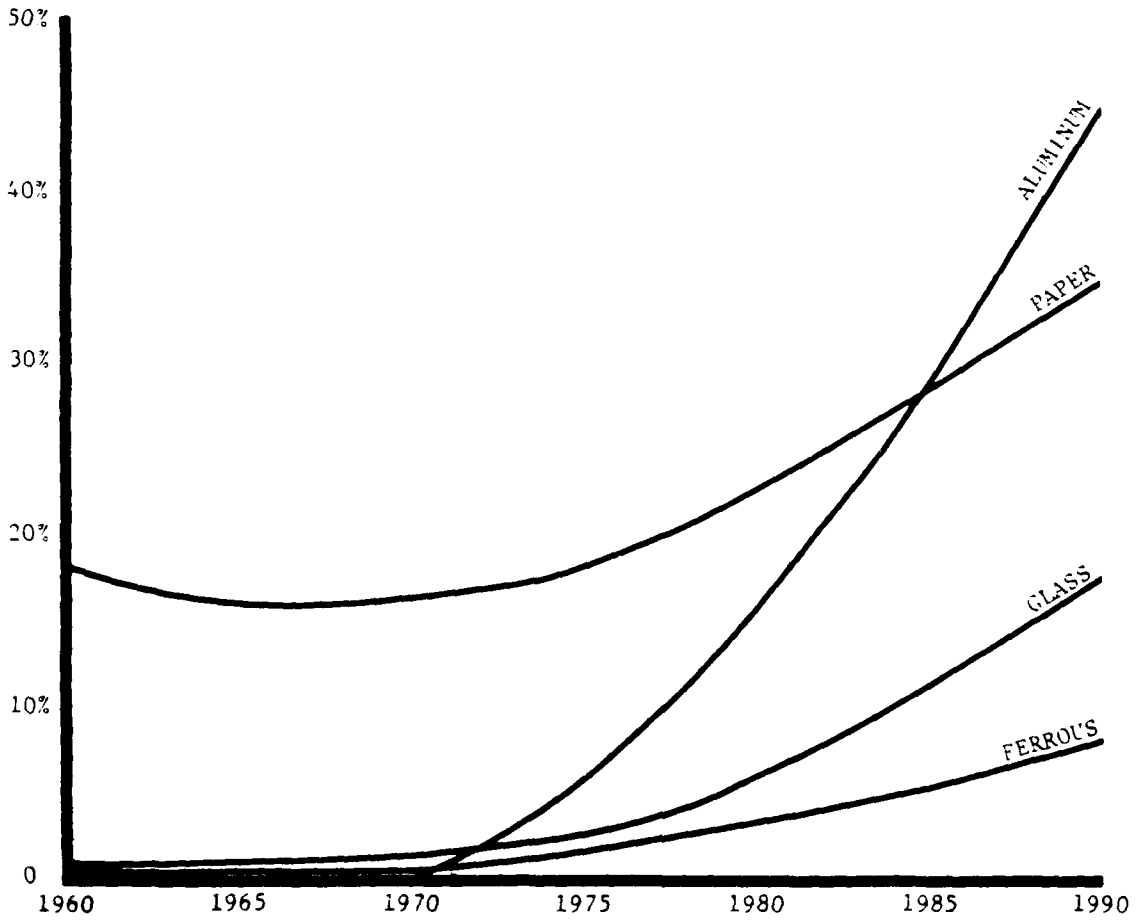
The average market values/ton of these constituents is projected in Section II-A and summarized below.

	1980	1985	1990
Paper	$ 33.00	$ 49.00	$ 66.00
Glass	11.00	15.00	18.00
Steel	25.00	28.00	33.00
Aluminum	370.000	600.00	780.00

These values are based on present recovery technologies which will improve perhaps in both the expected recoverable segment of the given constituent. National statistics on recent recovery are shown in Table II-C-1. Such properties will certainly apply to the Navy and, in fact, represent a conservative estimate. Because of the nature of a military

FIGURE II-C-1

TRENDS IN RESOURCE RECOVERY
FROM POST CONSUMER WASTE, 1960-1990
BY PERCENTAGE OF AVAILABLE WASTE PRODUCT



organization, a commitment to resource recovery might well yield much higher percentages of recovery.

An additional consideration is that upgrading of material purity (quality) may be achieved at a recovery site pending improved separation technology. Such activities may be economically feasible but may only be justified at intermediate collection facilities or at an actual material reprocessing plant depending on volume.

2. Economics of Recovery

No market is projected for recovered plastics/rubber other than energy recovery during incineration.

The volume of glass projected for generation in the Navy waste stream and the purer projected glass show a very low revenue potential and poor feasibility for economical operations. No data are generally available on the breakdown of metals in the Navy waste stream, but looking at the proportions found in the national waste stream suggests that roughly 20% of metals will be aluminum. A quick calculation shows the following expected revenues for aluminum recovery:

20% of metals = .20 x 4,343 = 869 tons
@ 50% recovery = 435 tons

In 1990 the price/ton is projected to be about $780.

TOTAL EXPECTED REVENUE = 435 tons x $870/ton
= $339,300

Given the logistics of recovery the figure does not justify a Navy-wide recovery program for aluminum. The same would hold for steel.

The constituent which shows obvious promise for recovery is paper, and the following example of economic analysis supports that contention.

POTENTIAL REVENUES FROM WASTE PAPER SALES

	1980	1990
o Total annual tonnage of wastepaper available for recycling	487,713	557,136
o Potential achievable recycling rate	20%	35%
o Weighted average of unprocessed wastepaper/ton	$33.00	$66.00
o Potential revenue from wastepaper sales	$3,218,905	$12,869,841*
o Typical waste disposal cost/ton	$8.00	$31.00*
o Wastepaper disposal savings to Navy/year	$780,430	$ 6,044,925*
o Annual Navy savings through waste-paper recycling	$3,999,245	$18,914,766

* Includes 12% annual inflation

With increasing paper recovery capacity and higher alternative disposal costs into the 1980s, the net from paper recovery will justify significant investment in recovery facilities.

APPENDICES

APPENDIX A

TABLE 1

NORTH ISLAND COLLECTION DATA - JUNE 1977
WASTE TYPE, BY GENERATOR/ORIGIN
(By Weight)

GENERATOR/ORIGIN	YD^3	DENSITY* (lbs/yd^3)	TOTAL WEIGHT	% TOTAL	PAPER	CARDBOARD	PLASTIC/ RUBBER	WOOD	YARD WASTE	FOOD WASTE	METAL	GLASS	INER
Housing	49.75	175.69	8,750	2.3	4,195	524	262	437	786	1,049	612	524	262
Office	2778.55	77.00	314.958	57.6	160,461	44,929	4,278	4,278					
Industrial	82.25	193.27	15,896	4.3	8,584	3,497		1,907	1,371	318	318		
Commercial	244.75	102.07	25,148	6.8	11,819	13,076		251					
Medical	25.78	77.00	1,985	.5	1,687	278		20					
Ships	368.75	112.59	41,517	11.2	15,776	10,794	415	4,982	1,245	5,812	1660		
Food Service	326.25	102.07	33,300	9.0	15,651	10,989	999	333	333	4,329	666		
Recreation Areas	23.75	102.07	2,424	.7	1,187	727	44	24	169	121	72	48	
Dormitories	276.25	102.07	28,196	7.6	6,203	20,301		282	282	564	564		
TOTALS:			371,154		225,563	105,115	6,022	12,514	4,086	12,193	3,892	572	262
% of Total:					61%	28%	2%	3%	1%	3%	1%	t	t

(t = trace)

Rows may not add to 100 due to rounding.

* *SEE TABLE 2*

SOURCE: SRI June 1978 - Tables 6, 8, and 10.

TABLE 2

N.A.S. NORTH ISLAND WASTE STREAM BY VOLUME OF GENERATION/ORIGIN TYPES - JUNE 1977
(yd^3)

Route No.	Housing	Office	Industrial	Commercial	Medical	Ships	Food Service	Recreation Areas	Dormitories	Total
120	25.50	108.75	6.25	0	0	30.00	6.75	5.00	0	182.25
110	0	140.00	3.00	0	7.00	31.25	10.75	0	0	192.00
210	0	69.50	5.00	15.00	0	0	13.50	0	52.00	155.00
120	0	140.75	5.00	0	0	41.25	15.25	0	0	202.25
220	0	14.50	29.00	23.75	0	7.50	0	0	0	74.75
110	0	123.00	0	0	1.50	31.25	13.50	0	0	169.25
210	0	52.75	6.50	37.75	0	0	20.25	5.75	34.75	157.75
121	0	117.50	0	0	0	0	4.50	0	0	122.00
122	0	0	0	0	0	26.25	0	0	0	26.25
110	0	150.00	0	0	2.25	0	18.50	0	0	170.75
210	5.25	55.25	0	27.50	0	0	19.50	0	26.50	134.00
120	0	105.50	1.50	0	0	11.25	3.75	0	0	122.00
110	0	169.00	0	0	3.00	0	18.25	0	0	190.25
120	0	106.00	0	11.75	0	0	8.25	0	0	126.00
210	0	94.25	0	33.75	0	3.75	20.25	6.00	9.75	167.75
110	0	153.00	0	0	1.50	0	8.50	0	0	163.00
210	0	53.25	0	20.50	0	0	8.75	0	54.50	137.00
120	0	116.75	5.00	0	0	21.25	5.25	1.00	0	149.25
110	0	144.25	0	0	1.50	0	9.25	0	0	155.00
210	19.00	49.25	0	16.50	0	0	15.75	6.00	28.75	135.25
120	0	100.50	20.00	0	0	5.00	8.25	0	0	133.75
220	0	34.75	0	20.75	0	0	9.00	0	6.00	70.50
110	0	128.25	0	0	3.75	30.00	12.50	0	0	174.50
121	0	86.00	1.00	0	0	0	8.25	0	0	95.25
122	0	0	0	0	0	30.00	0	0	0	30.00
110	0	123.25	0	0	6.00	32.50	3.00	0	0	164.75
210	0	60.50	0	37.50	0	0	21.50	0	40.25	159.75
121	0	131.75	0	0	0	0	26.00	0	0	157.75
122	0	0	0	0	0	10.00	0	0	0	10.00
221	0	25.25	0	0	0	0	0	0	0	25.25
222	0	0	0	0	0	27.50	0	0	0	27.50
110	0	125.50	0	0	2.25	30.00	17.25	0	0	175.00
	49.75	2778.55	82.25	244.75	25.78	368.75	326.25	23.75	276.25	

SOURCE: SRI June 1978 - Table 6

TABLE 3
SOLID WASTE SURVEY--NAS NORTH ISLAND, CALIFORNIA
BULK DENSITY STATISTICS
MULTIPLE REGRESSION ANALYSIS

	Bulk Density (lb/yd^3)	
Functional Components	Mean	Standard Deviation
Family Housing	175.69	11.69
Support	102.07	7.56
Office	77.00	8.20
Industrial	193.27	21.50
Unusual	112.59	6.56

SOURCE: SRI June 1978 - Table 10

TABLE 4

NORTH ISLAND

FUNCTIONAL SOLID WASTE COMPONENTS
AND TYPICAL GENERATORS

Functional Components	Typical Generators
Family housing	Military family residences
Support	Barracks
	Motels/lodges
	Mess halls
	Cafeterias
	Clubs
	Recreational areas
Office	Offices
	Classrooms
	Warehouses
	Community facilities
	Churches
	Bowling alleys
	Commissaries
	Hospitals
	Dispensaries
	Dental clinics
	Business establishments
	Exchanges
	Laundromats
Industrial	Maintenance areas
	Production areas
	Construction areas
Unusual	Anything other than the above

Source: SRI June 1978 - Table 8

TABLE 5
NORTH ISLAND CONSTITUENCY BREAKDOWN

WASTE TYPE, BY GENERATOR/ORIGIN
(Percent by Weight)

Generator/Origin	Paper	Cardboard	Plastic/ Rubber	Wood	Yard Waste	Food Waste	Metal	Glass	Inerts	Construction
Housing	48%	6%	3%	5%	9%	12%	7%	6%	3%	0%
Office	75	21	0	2	2	t	t	0	0	0
Industrial	54	22	t	12	8	2	2	0	t	0
Commercial	47	52	0	1	t	t	t	0	0	0
Medical	85	14	1	1	t	0	t	0	0	0
Ships	38	26	1	12	3	14	4	0	0	0
Food service	47	33	3	1	1	13	2	t	0	0
Recreation areas	49	30	2	1	7	5	3	2	0	0
Dormitories	22	72	t	1	1	2	2	0	0	0

t = trace.

Rows may not add to 100 due to rounding.

SOURCE: SRI January 1980 - Table 5

APPENDIX B

COMPARATIVE POPULATION DATA FOR SELECTED NAVAL FACILITIES
September 1980

	According to Base Public Affairs Officer		According to Dept. of the Navy, Washington, D.C.	
Philadelphia Naval Shipyard	Civilian: Military:	12,000 5,000	Civilian: Military:	12,591 5,587
Norfolk Naval Base	Civilian: Military:	16,200 63,061	Civilian: Military: _____:	26,384 33,049 1,500
Chicago (Great Lakes)	Civilian: Military:	4,000 18,000	Civilian: Military:	Not Available 21,586
San Diego (Miramar Naval Air Station)	Civilian: Military:	2,100 8,200	Civilian: Military:	Not Available 7,274
San Francisco Treasure Island Naval Station	Civilian Military:	8,750	Civilian: Military:	Not Available 1,738

DATA CHOSEN FOR* USE IN ESTIMATION

Philadelphia	Civilian:	12,591
	Military:	5,587
Norfolk	Civilian:	26,384
	Military:	33,049
Chicago	Civilian:	4,000
	Military:	18,000
San Diego	Civilian:	2,100
	Military:	8,200
San Francisco	Civilian:	7,012
	Military	1,738
TOTAL	Civilian:	52,087
	Military:	66,574
	Overall:	118,661

* Choices based on interviews with on base personnel and Navy staff at Pentagon.

APPENDIX C
TABLE 1

WASTE PRODUCTION OF FIVE SELECTED NAVAL FACILITIES
1980

PHILADELPHIA NAVAL SHIPYARD

1000 YD^3/day [a] @ 107.86 lb/yr [b] = 107860 lb/day [c] = 28,000,000 lbs/yr = 14000 TPY

NORFOLK NAVAL BASE

80,000 YD^3/month [a] @ 107.86 lb/YD^3 = 8628800 lb/month = 103,545,600 lb/yr = 51,800 TPY

CHICAGO (GREAT LAKES)

368,524 YD^3 yr [a] x 107.86 lb/YD^3 = 39,748,998 lb/yr = 19,874 TPY

SAN DIEGO (MIRAMAR)

11,407 YD^3/month [a] x 107.86 lb/YD^3 x 12 = 14,764,308 lb/yr = 7382 TPY

SAN FRANCISCO (TREASURE ISLAND)

4628 TPY [d]

TOTAL OF FIVE FACILITIES: 97,684 TPY

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[a] Base Public Works Department

[b] SRI June 1978 - Table 3

[c] Day: 5 day = 1 week

[d] Bay Cities Refuse

TABLE 2

AVERAGE BULK DENSITIES

Activity	Survey Date	Bulk Density (lb/yd^3)	
Mayport NS, Florida	January 1977	117.89	
NAD McAlester, Oklahoma	March 1977	114.53	
NSY Long Beach, California	November 1976	165.96	
N.SUP. New Orleans, Louisiana	March 1976	86.50	$\bar{x}$ = 107.86 lb/yd^3
NSA San Francisco, California	June 1976	79.87	σ = 27.61 lb/yd^3
NAS Alameda, California	April 1976	108.51	Range = 74.02 to 165.96 lb/yd^3
NSC Oakland, California	March 1976	74.02	
NAS Corpus Christi, Texas	March 1976	120.79	
NAB Coronado, California	January 1977	102.70	
NAS North Island, California	June 1977	93.48	$\bar{x}$ = 93.48 lb/yd^3 σ = 18.51 lb/yd^3 Range = 53.09 to 142.00 lb/yd^3

SOURCE: SRI June 1978 - Table 3

APPENDIX D*

The Naval Facilities Assets (NFA) System is an official record of financial and physicial data on Navy Facilities, which is maintained at the Facilities Systems Officer (FASCO). Within that system are Category Codes/Nomenclature (CCNs) developed by the Department of Defense (DOD) to identify, classify, and quantify all real property facilities owned, operated, or controlled by the U.S. Government. CCNs are based on a three-digit code specifying the Facility Class, the Category Group, and the Basic Category to which two digits are added to provide greater definitive categorization. More details on CCN classification are given below.

The first digit identifies the nine broad DOD facility classes:

	Series
Operational and training facilities	100
Maintenance and production facilities	200
Research, development and test facilities	300
Supply facilities	400
Hospital medical facilities	500
Administrative facilities	600
Housing and community facilities	700
Utilities and ground improvements	800
Real estate	900

The second digit identifies the two or more DOD Category Groups within each of the nine facility classes, the third digit identifies the DOD Basic Category, and, finally the fourth and fifth digits identify specific Navy facilities within DOD basic categories.

* From SRI Report to NCEL June 1978.

TABLE 1

CATEGORY CODES/NOMENCLATURE
FOR EACH SOLID WASTE GENERATOR/ORIGIN TYPE

Housing

711-xx*

Office

131-xx
133-xx
137-xx
141-xx, except 81
143-15
143-25
143-30
143-35
143-40
143-45
143-47
143-55
143-65
143-77
153-20
153-30
159-64
171-xx
310-xx
610-xx, except 77
620-xx
730-12, 20, 25, 45, 50, 55, 60, 67, 80, 36
740-18, 19, 27, 29, 33, 76, 88
760-10
811-09, 59
812-09
813-10
821-09
822-09
823-09, 15
826-10
827-10
842-09
843-50
844-10
845-10
872-20
890-09, 45

Industrial

123-15
142-xx
143-10
143-20
143-60
143-70
143-75
159-20
159-30
211-xx, except 59, 63, 65, 66, 69, 80
212-10
212-20
212-30
212-77
213-xx, except 10, 20, 40, 77
214-xx, except 55, 56
215-xx
216-xx
217-10, 30, 77
218-xx
219-xx, except 31, 77
221-xx
222-xx
223-10
224-xx
225-xx
226-xx, except 56, 66, 82
227-xx
228-xx
229-40, 50, 60, 77, 80
730-40, 70

Commercial

441-72
730-13, 30, 76, 78
740-01, 02, 03, 07, 08, 09, 10, 11, 12, 13, 15, 16, 17, 23, 24, 30, 31, 32, 34, 71

Medical

510-10
530-xx
540-10
550-10

Food Service

722-xx
740-04, 05, 26, 60, 63, 64, 66, 69, 70

Storage Areas

213-77
217-77
219-77
421-32, 42
424-10
431-10
441-xx, except 40, 72
740-85, 86
510-77
610-77
730-77
740-77
890-77

Recreation/Community Areas

730-35, 66
740-28, 35, 36, 37, 38, 39, 40, 43, 46, 50, 52, 53, 54, 55, 56, 74, 75, 77, 77, 78, 79, 80, 81, 82, 84, 87, 89

Ships

155-11
155-21
161-30

Dormatories

141-81
143-46
721-xx
723-20, 30, 40, 60, 77
724-xx
725-10
730-10, 15, 75, 81, 65
740-20, 21, 22

Treatment Plants

831-09, 14
832-29
833-09, 20, 40
841-09

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*xx = All basic category (fourth- and fifth-digit) numbers are included.

TABLE 2

ESTIMATED EMISSION FACTORS FOR EACH CCN GENERATOR/ORIGIN TYPE

CCN Generator/ Origin Type	Average (lb/1000 ft^2/day)
Housing	5.60
Office	4.20
Industrial	7.40
Commercial	11.90
Medical	5.00
Food service	80.50
Storage	1.30
Recreation (community facilities)	5.50
Ships	No data
Dormitories	1.90
Treatment plant	No data

TABLE 3

WASTE TYPE, BY GENERATOR/ORIGIN
(Percent by Weight)

Generator/Origin	Paper	Cardboard	Plastic/ Rubber	Textiles/ Leamer	Wood	Yard Waste	Food* Waste	Metal		Glass	Inerts	Sludges/ Ashes
								Ferrous	Nonferrous			
Housing	48	6	3	1	5	9	12	6	1	6	3	t
Office	75	21	t	t	2	2	t	t	t	t	t	0
Industrial	54	22	t	t	12	8	2	2	t	t	t	0
Commercial	47	52	t	t	1	t	t	t	t	t	t	0
Medical	85	14	1	t	1	t	t	t	t	t	t	0
Ships	38	26	1	t	12	3	14	3	1	t	t	0
Food service	47	33	3	0	1	1	13	1	1	t	t	0
Storage areas	68	23	1	t	4	4	t	t	t	t	t	0
Recreation/community areas	49	30	2	t	1	7	5	1	2	2	t	t
Dormitories	22	71	t	1	1	1	2	1	1	t	t	0
Treatment plants	0	0	0	0	0	0	t	0	0	0	t	99

*Including grease.

t = trace.
Rows may not add to 100 because of rounding.

GROSS DISCARDS - 1965

(In Thousands of Tons)

Product Category	Paper	Glass	Ferrous	Aluminum	Other Nonferrous	Plastics	Rubber & Leather	Textiles	Wood	Other	Total
Durable Goods:											9,184
Major Appliances	3	30	1,060	47	100	48	15	tr	tr	42	1,145
Furniture, Furnishings	tr	16	939	24	tr	1	20	490	676	--	2,166
Rubber Tires	--	--	27	--	--	--	982	94	--	--	1,103
Miscellaneous Durables	tr	450 e	3,100 e	75 e	125 e	70 e	450 e	--	300 e	--	4,570
Nondurable Goods, excl. Food:											18,482
Newspapers	7,062	--	--	--	--	--	--	--	--	--	7,062
Books, Magazines	3,231	--	--	--	--	--	--	--	--	--	3,231
Office Papers	2,115	--	--	--	--	--	--	--	--	--	2,115
Tissue Paper & Towels	1,116	--	--	--	--	--	--	--	--	--	1,116
Paper Plates, Cups	229	--	--	--	--	--	--	--	--	--	229
Other Nonpackaging Paper	2,448	--	--	--	--	--	--	--	--	--	2,448
Apparel	--	--	--	--	--	31	tr	1,504	--	--	1,535
Footwear	--	--	--	--	--	17	191	48	tr	--	256
Other Misc. Nondurables	--	--	--	35 e	--	80 e	300 e	75 e	--	--	490
Containers and Packaging:											
Glass Containers:	--	6,522	--	--	--	--	--	--	--	--	6,522
Beer, Soft Drinks	--	1,411	--	--	--	--	--	--	--	--	1,411
Wine, Liquor	--	1,228	--	--	--	--	--	--	--	--	1,228
Food & Others	--	3,883	--	--	--	--	--	--	--	--	3,883
Steel Cans:	--	--	4,655	--	--	--	--	--	--	--	4,655
Beer, Soft Drinks	--	--	637	--	--	--	--	--	--	--	637
Food	--	--	2,782	--	--	--	--	--	--	--	2,782
Other Nonfood Cans	--	--	980	--	--	--	--	--	--	--	980
Barrels, Drums, Pails, Misc.	--	--	256	--	--	--	--	--	--	--	256
Aluminum:	--	--	--	169	--	--	--	--	--	--	169
Beer, Soft Drinks	--	--	--	60	--	--	--	--	--	--	60
Other Cans	--	--	--	--	--	--	--	--	--	--	--
Aluminum Foil	--	--	--	109	--	--	--	--	--	--	109
Paper, Paperboard	13,248	--	--	--	--	--	--	--	--	--	13,248
Corrugated	7,143	--	--	--	--	--	--	--	--	--	7,143
Other Paperboard	3,256	--	--	--	--	--	--	--	--	--	3,256
Paper Packaging	2,849	--	--	--	--	--	--	--	--	--	2,849
Plastics:	--	--	--	--	--	112	--	--	--	--	112
Plastic Containers	--	--	--	--	--	52	--	--	--	--	52
Other Packaging	--	--	--	--	--	60	--	--	--	--	60
Wood Packaging	--	--	--	--	--	--	--	--	2,000 e	--	2,000
Other Misc. Packaging	--	--	--	--	--	5 e	10 e	75 e	30 e	--	120
TOTAL NONFOOD PRODUCT WASTE	29,452	7,018	9,781	350	225	364	1,968	2,268	3,006	47	54,492
Add: Food Waste											19,150
Yard Waste											20,800
Miscellaneous Inorganic Wastes											1,300
TOTAL											95,742
PERCENT	30.7					1.38	2.06	2.38	3.14		

GROSS DISCARDS - 1965

(In Thousands of Tons)

Product Category	Paper	Glass	Ferrous	Aluminum	Other Nonferrous	Plastics	Rubber & Leather	Textiles	Wood	Other	Total
Durable Goods:											10,411
Major Appliances	5	4	642	44	105	15	9	tr	tr	47	871
Furniture, Furnishings	tr	25	1,046	33	tr	27	35	497	1,131	--	2,794
Rubber Tires	--	--	34	--	--	--	1,207	115	--	--	1,356
Miscellaneous Durables	tr	550 e	3,400 e	80 e	150 e	160 e	600 e	--	350 e		5,290
Nondurable Goods, excl. Food:											23,037
Newspapers	8,167	--	--	--	--	--	--	--	--	--	8,167
Books, Magazines	4,187	--	--	--	--	--	--	--	--	--	4,187
Office Papers	2,962	--	--	--	--	--	--	--	--	--	2,962
Tissue Paper & Towels	1,535	--	--	--	--	--	--	--	--	--	1,535
Paper Plates, Cups	341	--	--	--	--	--	--	--	--	--	341
Other Nonpackaging Paper	2,802	--	--	--	--	--	--	--	--	--	2,802
Apparel	--	--	--	--	--	38	tr	1,822	--	--	1,860
Footwear	--	--	--	--	--	29	165	34	tr	--	228
Other Misc. Nondurables	--	--	--	45 e	--	70	400	80 e	--	--	955
Containers and Packaging:											
Glass Containers:	--	7,979	--	--	--	--	--	--	--	--	7,979
Beer, Soft Drinks	--	2,555	--	--	--	--	--	--	--	--	2,555
Wine, Liquor	--	1,291	--	--	--	--	--	--	--	--	1,291
Food & Others	--	4,133	--	--	--	--	--	--	--	--	4,133
Steel Cans:	--	--	4,757	--	--	--	--	--	--	--	4,757
Beer, Soft Drinks	--	--	899	--	--	--	--	--	--	--	899
Food	--	--	2,655	--	--	--	--	--	--	--	2,655
Other Nonfood Cans	--	--	945	--	--	--	--	--	--	--	945
Barrels, Drums, Pails, Misc.	--	--	258	--	--	--	--	--	--	--	258
Aluminum:	--	--	--	275	--	--	--	--	--	--	275
Beer, Soft Drinks	--	--	--	102	--	--	--	--	--	--	102
Other Cans	--	--	--	18	--	--	--	--	--	--	18
Aluminum Foil	--	--	--	155	--	--	--	--	--	--	155
Paper, Paperboard	16,998	--	--	--	--	--	--	--	--	--	16,998
Corrugated	9,876	--	--	--	--	--	--	--	--	--	9,876
Other Paperboard	3,867	--	--	--	--	--	--	--	--	--	3,867
Paper Packaging	3,255	--	--	--	--	--	--	--	--	--	3,255
Plastics:	--	--	--	--	--	932	--	--	--	--	932
Plastic Containers	--	--	--	--	--	317	--	--	--	--	317
Other Packaging	--	--	--	--	--	615	--	--	--	--	615
Wood Packaging	--	--	--	--	--	--	--	--	1,900 e	--	1,900
Other Misc. Packaging	--	--	--	--	--	10 e	15 e	80 e	25 e	--	130
TOTAL NONFOOD PRODUCT WASTE	36,997	8,558	9,879	477	255	1,641	2,431	2,628	1,406	47	66,319
Add: Food Waste											20,600
Yard Waste											22,300
Miscellaneous Inorganic Wastes											1,500
TOTAL											110,719

GROSS DISCARDS - 1970

(In Thousands of Tons)

Product Category	Paper	Glass	Ferrous	Aluminum	Other Nonferrous	Plastics	Rubber & Leather	Textiles	Wood	Other	Total
Durable Goods:											
Major Appliances	11	68	2,065	83	158	112	43	tr	tr	46	14,199
Furniture, Furnishings	tr	29	1,270	36	tr	88	39	443	1,701	--	2,586
Rubber Tires	--	--	46	--	--	--	1,639	157	--	--	3,606
Miscellaneous Durables	tr	700 e	3,750 e	90 e	175 e	300 e	750 e	--	400 e	--	1,842
											6,165
Nondurable Goods, excl. Food:											
Newspapers	9,542	--	--	--	--	--	--	--	--	--	27,830
Books, Magazines	5,103	--	--	--	--	--	--	--	--	--	9,542
Office Papers	3,822	--	--	--	--	--	--	--	--	--	5,103
Tissue Paper & Towels	2,169	--	--	--	--	--	--	--	--	--	3,822
Paper Plates, Cups	433	--	--	--	--	--	--	--	--	--	2,169
Other Nonpackaging Paper	2,781	--	--	--	--	--	--	--	--	--	433
Apparel	--	--	--	--	--	50	tr	2,272	--	--	2,781
Footwear	--	--	--	--	--	43	259	56	tr	--	2,322
Other Misc. Nondurables	--	--	--	55 e	--	755 e	500 e	90 e	--	--	358
											1,400
Containers and Packaging:											
Glass Containers:	--	11,576	--	--	--	--	--	--	--	--	11,576
Beer, Soft Drinks	--	5,579	--	--	--	--	--	--	--	--	5,579
Wine, Liquor	--	1,702	--	--	--	--	--	--	--	--	1,702
Food & Others	--	4,295	--	--	--	--	--	--	--	--	4,295
Steel Cans:	--	--	5,383	--	--	--	--	--	--	--	5,383
Beer, Soft Drinks	--	--	1,575	--	--	--	--	--	--	--	1,575
Food	--	--	2,505	--	--	--	--	--	--	--	2,505
Other Nonfood Cans	--	--	1,033	--	--	--	--	--	--	--	1,033
Barrels, Drums, Pails, Misc.	--	--	270	--	--	--	--	--	--	--	270
Aluminum:	--	--	--	561	--	--	--	--	--	--	561
Beer, Soft Drinks	--	--	--	273	--	--	--	--	--	--	273
Other Cans	-	--	--	56	--	--	--	--	--	--	56
Aluminum Foil	--	--	--	232	-	--	--	--	--	--	232
Paper, Paperboard	20,462	--	--	--	--	--	--	--	--	-	20,462
Corrugated	12,410	--	--	--	--	--	--	--	--	--	12,410
Other Paperboard	4,280	--	--	--	--	--	--	--	--	--	4,280
Paper Packaging	3,772	--	--	--	--	--	--	--	--	--	3,772
Plastics:	--	--	--	--	--	1,954	--	--	--	-	1,954
Plastic Containers	--	--	--	--	--	853	--	--	--	--	853
Other Packaging	--	--	--	--	--	1,101	--	--	--	--	1,101
Wood Packaging	--	--	--	--	--	--	--	--	1,800 e	--	1,800
Other Misc. Packaging	--	--	--	--	--	20 e	15 e	90 e	20 e	--	145
TOTAL NONFOOD PRODUCT WASTE	44,223	12,371	12,514	825	333	3,322	3,245	3,108	3,921	46	83,910
Add: Food Waste											21,700
Yard Waste											23,600
Miscellaneous Inorganic Wastes											1,800
TOTAL											131,010

GROSS DISCARDS - 1977

(In Thousands of Tons)

Product Category	Paper	Glass	Ferrous	Aluminum	Other Nonferrous	Plastics	Rubber & Leather	Textiles	Wood	Other	Total
Durable Goods:											16,458
Major Appliances	20	46	1,791	89	197	84	45	tr	--	53	2,322
Furniture, Furnishings	tr	97	1,619	37	tr	224	48	571	2,573	--	5,169
Rubber Tires	--	--	4,748	--	--	--	1,704	163	--	--	1,915
Miscellaneous Durables	tr	950 e	3,850 e	150 e	200 e	500 e	900 e	--	500 e	--	7,050
Nondurable Goods, excl. Food:											30,508
Newspapers	9,657	--	--	--	--	--	--	--	--	--	9,657
Books, Magazines	6,690	--	--	--	--	--	--	--	--	--	6,690
Office Papers	4,503	--	--	--	--	--	--	--	--	--	4,503
Tissue Paper & Towels	2,368	--	--	--	--	--	--	--	--	--	2,368
Paper Plates, Cups	389	--	--	--	--	--	--	--	--	--	389
Other Nonpackaging Paper	2,678	--	--	--	--	--	--	--	--	--	2,678
Apparel	--	--	--	--	--	47	--	1,968	--	--	2,010
Footwear	--	--	--	--	--	63	209	61	tr	--	333
Other Misc. Nondurables	--	--	--	70 e	--	1,100 e	610 e	100 e	--	--	1,880
Containers and Packaging:											
Glass Containers:	--	13,588	--	--	--	--	--	--	--	--	13,588
Beer, Soft Drinks	--	7,002	--	--	--	--	--	--	--	--	7,002
Wine, Liquor	--	2,076	--	--	--	--	--	--	--	--	2,076
Food & Others	--	4,510	--	--	--	--	--	--	--	--	4,510
Steel Cans:	--	--	4,515	--	--	--	--	--	--	--	4,515
Beer, Soft Drinks	--	--	1,119	--	--	--	--	--	--	--	1,119
Food	--	--	2,278	--	--	--	--	--	--	--	2,278
Other Nonfood Cans	--	--	847	--	--	--	--	--	--	--	847
Barrels, Drums, Pails, Misc.	--	--	271	--	--	--	--	--	--	--	271
Aluminum:	--	--	--	1,012	--	--	--	--	--	--	1,012
Beer, Soft Drinks	--	--	--	699		-	--	--	-	--	699
Other Cans	--	--	--	30		-	--	--	--	--	30
Aluminum Foil	--	--		283			--		--	--	283
Paper, Paperboard	21,700	-	--	--	--	--	--	--	--	--	21,700
Corrugated	15,059	--	--	--	--	--	--	--	--	--	15,059
Other Paperboard	4,580	--	--	--	--	--	--	--	--	--	4,580
Paper Packaging	4,061	--	--	--	-		--	--	--	--	4,061
Plastics:	--	--	--	-	-	1,277	-	-	--	-	1,277
Plastic Containers	--	--	--	-		1,520	--	--	--	--	1,520
Other Packaging	--	--	--	-		1,757	--	--	--	--	1,757
Wood Packaging	--	--	--	-	-		-	-	1,600 e	--	1,600
Other Misc. Packaging	--		-	--	--	40 e	15 e	100 e	20 e	--	175
TOTAL NONFOOD PRODUCT WASTE	50,005	16,081	11,853	1,357	197	5,130	1,531	2,963	4,693	53	94,853
Add: Food Waste											73,200
Yard Waste											26,400
Miscellaneous Inorganic Wastes											2,100
TOTAL											196,553

GROSS DISCARDS - 1980

(In Thousands of Tons)

Product Category	Paper	Glass	Ferrous	Aluminum	Other Nonferrous	Plastics	Rubber & Leather	Textiles	Wood	Other	Total
Durable Goods:											18,011
Major Appliances	27	48	2,051	106	247	96	56	tr	tr	61	2,692
Furniture, Furnishings	--	130	1,642	54	--	333	43	620	2,921	--	5,743
Rubber Tires	--	--	54	--	--	--	1,919	183	--	--	2,156
Miscellaneous Durables	tr	1,000 e	4,000 e	175 e	225 e	550 e	950 e	--	520 e	--	7,420
Nondurable Goods, excl. Food:											11,887
Newspapers	11,325	--	--	--	--	--	--	--	--	--	11,325
Books, Magazines	6,938	--	--	--	--	--	--	--	--	--	6,938
Office Papers	4,956	--	--	--	--	--	--	--	--	--	4,956
Tissue Paper & Towels	2,342	--	--	--	--	--	--	--	--	--	2,342
Paper Plates, Cups	426	--	--	--	--	--	--	--	--	--	426
Other Nonpackaging Paper	2,893	--	--	--	--	--	--	--	--	--	2,893
Apparel	--	--	--	--	--	49	tr	2,510	--	--	2,559
Footwear	--	--	--	--	--	71	212	65	tr	--	348
Other Misc. Nondurables	--	--	--	125 e	--	1,200	650 e	125 e	--	--	2,100
Containers and Packaging:											
Glass Containers:	--	15,000	--	--	--	--	--	--	--	--	15,000
Beer, Soft Drinks	--	7,360	--	--	--	--	--	--	--	--	7,360
Wine, Liquor	--	2,580	--	--	--	--	--	--	--	--	2,580
Food & Others	--	5,060	--	--	--	--	--	--	--	--	5,060
Steel Cans:	--	--	4,317	--	--	--	--	--	--	--	4,317
Beer, Soft Drinks	--	--	977	--	--	--	--	--	--	--	977
Food	--	--	2,260	--	--	--	--	--	--	--	2,260
Other Nonfood Cans	--	--	800	--	--	--	--	--	--	--	800
Barrels, Drums, Pails, Misc.	--	--	280	--	--	--	--	--	--	--	280
Aluminum:	--	--	--	1,157	--	--	--	--	--	--	1,152
Beer, Soft Drinks	--	--	--	845	--	--	--	--	--	--	845
Other Cans	--	-	-	30	--	--	-	--		--	30
Aluminum Foil	--		-	312	--	-	--	--	-	--	312
Paper, Paperboard	25,718	-	--	--	-	--	--	--	--	--	25,718
Corrugated	16,370	--	--	--	--	--	--	--	-	--	16,370
Other Paperboard	5,254	--	--	--	--	--	--	--	--	--	5,254
Paper Packaging	4,094	--	--	--	--	--	--	-	--	--	4,094
Plastics:	--	--	--	--	--	4,199	--	--	--	-	4,199
Plastic Containers	--	--	--	--	--	2,066	--	--	--	--	2,066
Other Packaging	--	--	--	--	--	2,133	--	--	--	--	2,133
Wood Packaging	--	--	-	--	--		--	-	1,520	--	1,520
Other Misc. Packaging	--	--	--	--	--	45 e	15 e	105 e	20 e	--	185
TOTAL NONFOOD PRODUCT WASTE	54,625	16,178	17,064	1,617	472	6,543	1,845	1,608	4,981	61	103,994
Add: Food Waste											23,800
Yard Waste											27,100
Miscellaneous Inorganic Wastes											2,200
TOTAL											157,094

GROSS DISCARDS - 1985

(In Thousands of Tons)

Product Category	Paper	Glass	Ferrous	Aluminum	Other Nonferrous	Plastics	Rubber & Leather	Textiles	Wood	Other	Total
Durable Goods:											20,404
Major Appliances	15	63	2,331	100	209	107	65	tr	tr	61	2,951
Furniture, Furnishings	--	163	1,995	84	--	395	33	792	3,765	--	7,227
Rubber Tires	--	--	59	--	--	--	2,088	199	--	--	2,346
Miscellaneous Durables	tr	1,050	4,200 e	200	250 e	640	1,000 e	--	540	--	7,880
Nondurable Goods, excl. Food:											37,375
Newspapers	12,340	--	--	--	--	--	--	--	--	--	12,340
Books, Magazines	7,898	--	--	--	--	--	--	--	--	--	7,898
Office Papers	5,744	--	--	--	--	--	--	--	--	--	5,744
Tissue Paper & Towels	2,466	--	--	--	--	--	--	--	--	--	2,466
Paper Plates, Cups	519	--	--	--	--	--	--	--	--	--	519
Other Nonpackaging Paper	2,794	--	--	--	--	--	--	--	--	--	2,794
Apparel	--	--	--	--	--	56	tr	2,675	--	--	2,731
Footwear	--	--	--	--	--	81	239	73	tr	--	393
Other Misc. Nondurables	--	--	--	140 e	--	1,500 e	700 e	150 e	--	--	2,490
Containers and Packaging:											
Glass Containers:	--	15,150	--	--	--	--	--	--	--	--	15,150
Beer, Soft Drinks	--	7,570	--	--	--	--	--	--	--	--	7,570
Wine, Liquor	--	3,010	--	--	--	--	--	--	--	--	3,010
Food & Others	--	5,170	--	--	--	--	--	--	--	--	5,170
Steel Cans:	--	--	4,100	--	--	--	--	--	--	--	4,100
Beer, Soft Drinks	--	--	930	--	--	--	--	--	--	--	930
Food	--	--	2,120	--	--	--	--	--	--	--	2,120
Other Nonfood Cans	--	--	750	--	--	--	--	--	--	--	750
Barrels, Drums, Pails, Misc.	--	--	300	--	--	--	--	--	--	--	300
Aluminum:	--	--	--	1,318	--	--	--	--	--	--	1,318
Beer, Soft Drinks	--	--	--	946	--	--	--	--	--	--	946
Other Cans	--	--	--	30	--	--	--	--	--	--	30
Aluminum Foil	--	--	--	372	--	--	--	--	--	--	372
Paper, Paperboard	28,300	--	--	--	--	--	--	--	--	--	28,300
Corrugated	18,830	--	--	--	--	--	--	--	--	--	18,830
Other Paperboard	5,558	--	--	--	--	--	--	--	--	--	5,558
Paper Packaging	4,412	--	--	--	--	--	--	--	--	--	4,412
Plastics:	--	--	--	--	--	5,802	--	--	--	--	5,802
Plastic Containers	--	--	--	--	--	3,073	--	--	--	--	3,073
Other Packaging	--	--	--	--	--	2,729	--	--	--	--	2,729
Wood Packaging	--	--	--	--	--	--	--	--	1,450 e	--	1,450
Other Misc. Packaging	--	--	--	--	--	60 e	20 e	100 e	20 e	--	210
TOTAL NONFOOD PRODUCT WASTE	60,576	16,426	12,685	1,842	459	8,641	4,145	3,999	5,775	61	114,609
Add: Food Waste											24,900
Yard Waste											28,400
Miscellaneous Inorganic Wastes											2,500
TOTAL											170,409

GROSS DISCARDS - 1990

(In Thousands of Tons)

Product Category	Paper	Glass	Ferrous	Aluminum	Other Nonferrous	Plastics	Rubber & Leather	Textiles	Wood	Other	Total
Durable Goods:											
Major Appliances	28	69	2,724	129	290	127	79	tr	tr	74	3,561
Furniture, Furnishings	--	250	2,542	130	--	605	20	1,059	4,513	--	9,119
Rubber Tires	--	--	65	--	--	--	2,299	219	--	--	2,583
Miscellaneous Durables	tr	1,100 e	4,400 e	225 e	275 e	720	1,050 e	--	570 e	--	8,340
Nondurable Goods, excl. Food:											41,423
Newspapers	13,155	--	--	--	--	--	--	--	--	--	13,155
Books, Magazines	9,097	--	--	--	--	--	--	--	--	--	9,097
Office Papers	6,616	--	--	--	--	--	--	--	--	--	6,616
Tissue Paper & Towels	2,643	--	--	--	--	--	--	--	--	--	2,643
Paper Plates, Cups	618	--	--	--	--	--	--	--	--	--	618
Other Nonpackaging Paper	2,761	--	--	--	--	--	--	--	--	--	2,761
Apparel	--	--	--	--	--	62	tr	2,880	--	--	2,942
Footwear	--	--	--	--	--	87	245	73	tr	--	405
Other Misc. Nondurables	--	--	--	160 e	--	1,800 e	750 e	175 e	--	--	2,885
Containers and Packaging:											
Glass Containers:	--	16,500	--	--	--	--	--	--	--	--	16,500
Beer, Soft Drinks	--	7,870	--	--	--	--	--	--	--	--	7,870
Wine, Liquor	--	3,450	--	--	--	--	--	--	--	--	3,450
Food & Others	--	5,180	--	--	--	--	--	--	--	--	5,180
Steel Cans:	--	--	3,975	--	--	--	--	--	--	--	3,975
Beer, Soft Drinks	--	--	985	--	--	--	--	--	--	--	985
Food	--	--	1,980	--	--	--	--	--	--	--	1,980
Other Nonfood Cans	--	--	700	--	--	--	--	--	--	--	700
Barrels, Drums, Pails, Misc.	--	--	310	--	--	--	--	--	--	--	310
Aluminum:	--	--	--	1,480	--	--	--	--	--	--	1,480
Beer, Soft Drinks	--	--	--	1,010	--	--	--	--	--	--	1,010
Other Cans	--	--	--	10	--	--	--	--	--	--	10
Aluminum Foil	--	-	--	440	-	-	-	--	-	--	440
Paper, Paperboard	32,062	-	--	-	-	--	-	-	--	-	32,062
Corrugated	21,560	--	--	--	--	--	--	--	--	--	21,560
Other Paperboard	5,798	--	--	--	--	--	--	--	--	--	5,798
Paper Packaging	4,704	--	--	--	--	--	--	--	--	--	4,704
Plastics:	--	--	--	--	--	7,689	--	--	--	--	7,689
Plastic Containers	--	--	--	--	--	4,322	--	--	--	--	4,322
Other Packaging	--	--	--	--	--	3,367	--	--	--	--	3,367
Wood Packaging	--	--	--	--	--	--	--	--	1,400 e	--	1,400
Other Misc. Packaging	--	--	--	--	--	75 e	25 e	120 e	20 e	--	240
TOTAL NONFOOD PRODUCT WASTE	66,990	17,919	13,706	2,123	565	11,165	4,468	4,526	6,503	74	128,040
Add: Food Waste											26,100
Yard Waste											29,700
Miscellaneous Inorganic Wastes											2,700
TOTAL											186,540
Thousand Tons	66,990	17,919	13,706								
Percent	35.9	9.6	7.34	1.14	0.30	6.0	2.4	2.4	3.5		

NARI CIRCULAR SR-78

Commercial Guidelines

and

Technical Classifications

for Scrap Rubber

EFFECTIVE NOVEMBER 1, 1978

Rubber Recycling Division

A Commodity Division of the

National Association of Recycling Industries, Inc.
330 Madison Avenue, New York, N. Y. 10017

Commercial Guidelines and Technical Classifications for Scrap Rubber

GENERAL NOTE — The purpose of these technical classifications is to provide descriptions of those materials which are most frequently purchased. Any item for which classifications are not specified should be the subject of negotiation between buyer and seller and clearly described.

Commercial Guidelines

The general business practices and technical classifications described herein explain current commercial practices and provide technical classifications of the most frequently traded grades of rubber scrap. These guidelines are not intended to challenge any legal business codes or existing contracts; rather, they are to encourage orderly commerce in scrap rubber commodities by clearly identifying commercial and technical practices with particular relevance to the recycling of rubber scrap. These guidelines should be applied to transactions in all grades of scrap rubber.

Essential to the success of any business relationship is an atmosphere of "good faith" between the buyer and seller. The parties involved should, therefore, endeavor to be as specific and clear about all aspects of a transaction as possible.

The seller should use diligence in assuring that the shipment consists of properly packed scrap of the type(s) specified in the purchase contract and that the shipment is made in compliance with the prearranged schedule for delivery. The buyer should similarly strictly adhere to all provisions of the transaction; arbitrary rejections, deductions or cancellations by the buyer are counter to good trade practice.

1. COUNTRY OF ORIGIN

Because of technical and chemical variations in rubber manufacturing, the country of origin of the scrap should be clearly indicated on the purchase order. The specifications given in the Technical Classifications Section are for rubber manufactured in the United States or Canada, or its equivalent. Scrap rubber manufactured in a different country should be so specified on the purchase agreement.

A) *Foreign Scrap* — Shipments of foreign scrap are subject to the same specifications and conditions as domestic shipments. However, special note should be taken of differing weight measures and packing requirements.

2. QUANTITY

A) *Net Weight* — All grades of scrap rubber are paid for on the basis of the net weight determined at the buyer's plant unless otherwise agreed to. Bags, coverings or containers are to be excluded from the net weight and the buyer is not obligated to return them unless agreed to by prior arrangement.

B) *Ton Weight* — Domestic shipments are based on the short ton (2,000 pounds). If the transaction is for a specific tonnage, the order is considered complete if the delivered weight variation is within 2% of the amount ordered.

Although some purchases are made on a carload or truckload basis, an exact weight should be specified as soon as possible to avoid misunderstandings.

3. PACKING

A) *Packages* — Whole tires may be shipped bundled or loose in cars or trucks. All other grades should be securely packed in containers of a type agreed upon between the buyer and seller, and which complies with transportation regulations.

Bales are generally assumed to weigh between 500 and 2,500 pounds and to be securely bound. Any variation should be subject to prior agreement. Bales which fall apart during shipment or unloading are considered a "loose shipment." Material shipped contrary to these practices can be considered improper delivery and subject to rejection (see Section 7—Claims and Rejections).

B) *Separation of Grades* — Each grade of scrap rubber should be packed separately. Intermingling of grades or foreign matter will cause a claim or rejection of the shipment. A maximum of three grades of scrap should be shipped in any car or truck. Each grade must be properly segregated and clearly labeled.

C) *Moisture and Foreign Material* — All scrap rubber shall be free from foreign material, including mud, stones and cinders. Two and one-half per cent (2½%) is considered normal and allowable moisture. An adjustment of the invoice will be made for moisture in excess of this figure. Special arrangements should be made between the shipper and buyer for shipments made in an open top conveyance. When a shipment is received wet, one of these two procedures should be followed by the buyer:

(1) He may estimate the amount of moisture and arrange for an allowance by mutual agreement with the shipper; or

(2) He may select a representative sample of a shipment to determine the moisture content. This determination shall be made by drying the sample and determining the per cent shrinkage from wet to dry weight, which per cent shall be considered representative of the shipment.

4. SHIPPING

A) *Shipping Instructions* — Shipping instructions should clearly specify shipping schedule, route, delivering carrier and destination.

A shipping notice or an invoice showing the date of shipment, car number, and contents should be mailed to the buyer within 24 hours of shipment. On request, a bill of lading should also be furnished.

B) *Transportation Charges and Transfer of Title* — The purchase contract should clearly indicate with the use of such phrases as "f.o.b. shipping point" or "delivered destination" or "f.o.b. shipping point — ($$$) freight allowed," how the transportation charges are to be handled and at what point the transfer of title takes place.

5. UNLOADING AND INSPECTION

After arrival of the shipment, the buyer should inspect the contents to the extent possible while it is still loaded.

If the shipment appears to be in accordance with the order and shipping notice, the buyer should proceed with the unloading.

If the shipment does not appear to be in accordance with the order or shipping notice, or if the quality is judged not to be in accordance with specifications as agreed, the buyer should immediately notify the seller of the rejection before unloading.

Where the bales are tagged or labeled, the buyer should keep an accurate tally by identifying each bale by number, grade and weight.

6. INVOICING

Invoicing should conform to instructions on the purchase order and include the following data:

a. Date of shipment
b. Car or truck number
c. Customer's order number
d. Shipper's invoice number
e. F.O.B. point
f. Number of bales
g. Quantity and grade
h. Price and extension
i. Terms

7. CLAIMS AND REJECTIONS

A) *Improper Delivery* — The existence of any of the following conditions is considered to be an improper delivery:

(1) The shipment is improperly packed;

(2) The shipment includes material not covered by the purchase order;

(3) The shipment is not a good delivery of the grade of scrap bought;

(4) Transportation of the shipment is made contrary to the specified schedule, method or form of conveyance or route.

B) *In the Case of Improper Delivery*:

(1) The buyer should immediately notify the seller of the claim or rejection in writing. Due diligence should be given to the rapid transmission of the message.

a) The rejected material should be protected and located in such a manner that it can be readily sorted or segregated.

b) Upon request of the shipper, rejected material shall be returnable to the seller promptly, usually within ten (10) days on domestic shipments.

c) If the buyer does not receive instructions for the disposition of the rejected material from the seller within thirty (30) days, the buyer shall advise the seller in writing of the action he intends to take.

(2) The seller is obligated to expeditiously give the buyer written notice of how the rejected shipment or part thereof is to be handled.

a) The seller may request to inspect the rejected material within three (3) business days and during such period give the buyer instructions for the disposition of the rejected material.

b) When the rejected shipment has already been unloaded, the seller has thirty (30) days in which to furnish specific instructions on how the rejected material is to be handled.

c) The seller may make a replacement shipment of the rejected shipment at the buyer's plant within thirty (30) days after notice of rejection.

d) The seller will usually be held responsible for the cost of: additional sorting; packaging; reloading; and, return freight.

(3) The buyer and seller may negotiate a partial or total acceptance of the claim or rejection and of any attendant costs.

8. ARBITRATION

In the event that a buyer and seller are unable to resolve a claim or rejection, consideration should be given to the use of the arbitration facilities of the National Association of Recycling Industries, Inc.

Technical Classifications

The following are the standard grades of scrap rubber. Specifications for any group apply to all the divisions of that group:

I. TIRES

Passenger and truck or mixed tires shall consist of whole roadworn pneumatic tire casings and shall be free from the following: tire sections; hard oxidized, burnt or filled tires; nonpneumatic, bicycle, motorcycle and puncture-sealing tubeless tires; and metal. Tractor, airplane and industrial tires, tires with metal studs or construction, exclusive of beads and tires over 12 inch cross section, are not acceptable unless so specified in the purchase contract.

The following shall be considered standard grades of pneumatic tires:

A. Passenger tires (6 ply rating or less).

B. White sidewall passenger tires (6 ply rating or less).

C. Truck tires (over 6 ply rating excluding those over 12-inch cross section).

D. Mixed passenger and truck tires.

All of the above may be specified as beadless or whole tires.

II. TIRE PARTS

Consist of grades resulting from the splitting or processing of scrap tires. They shall be free from metal, leather, and hard, burnt, or oxidized material.

Shipments of passenger and truck tire parts, (Grades A,B,C, and D) shall be packed separately. Mixtures of these grades are not acceptable unless it is so specified in the purchase contract. These grades may be further classified at the option of the buyer as natural rubber, synthetic rubber or retreaded parts.

A. *No. 1 Peelings* — Consist of treads stripped from pneumatic tires and shall be free of fabric.

B. *No. 2 Peelings* — Consist of treads stripped from pneumatic tires. The treads may contain cushion rubber, breaker fabric, and sidewalls adhering to them, but no more than one ply of carcass fabric.

C. *No. 3 Peelings* (Baldhead) — These peelings are the same as No. 2 Peelings, Grade II-B, except that a part of the tread has been removed.

D. S.A.G. (Special Automotive Grade) — Consists of pieces of pneumatic tires from which the treads and beads have been removed; they may or may not contain sidewall rubber.

III. TIRE TREAD BUFFINGS

Consist of unscreened rubber particles resulting from the preparation of passenger or truck tires for retreading. The nature and degree of foreign material, if any, shall be subject to prior specification.

IV. TUBES

Consist of roadworn inner tubes from pneumatic tires, free from the following: crusty, oxidized and semi-cured tubes; puncture proof and puncture-seal tubes; fiber-containing tubes; bicycle tubes; metal and punchings. Sections of tubes less than 12 inches long are not considered good delivery. All tubes, except Grade IV-C—Unsorted Tubes, shall be free from metal valves. Grades IV-A—Red Passenger Tubes, and IV-B—Red Truck Tubes shall, in addition, be free from black rubber valve cots and the bases of such valves.

A. *Red Passenger Tubes* — Consist of red natural rubber passenger tubes.

B. *Red Truck Tubes* — Consist of red natural rubber truck tubes.

C. *Natural Black Passenger Tubes* — Consist of black natural rubber compounded passenger tubes.

D. *Natural Black Truck Tubes* — Consist of black natural rubber compounded truck tubes.

E. *Chlorobutyl Tubes* — Consist of black chlorobutyl rubber tubes properly identified with a green stripe.

F. *Butyl Rubber Tubes* — Consist of black butyl rubber tubes properly identified with a blue stripe.

G. *Unsorted Tubes* — Consist of tubes of various sizes, colors and qualities and may contain valves unless otherwise specified in the purchase contract.

V. SPECIAL CLASSIFICATIONS

Scrap rubber of a character and type not described by the classifications for standard grades is a *special grade*, subject to custom specification by the buyer. Such scrap shall be clean, free from foreign material, and from crusty, hard, or oxidized material. It shall be equal in all respects to the sample submitted. Any material not meeting the prearranged specifications may be rejected. (Factory rejected scrap, including tires and tubes, falls into this classification.)

Official Copies of this Classification always carry the Association's Seal

(Printed on Recycled Paper)

NARI CIRCULAR CS-80

Standards and Practices

for

Cotton-Synthetics

EFFECTIVE SEPTEMBER 30, 1979
(Supersedes CS-74)

National Association of Recycling Industries, Inc.
330 Madison Avenue, New York City, N. Y. 10017

PREAMBLE

These standards and practices are recommended for use in the United States and Canada. Contracts and specifications for export transactions should be negotiated on an individual basis.

Basic to the success of any buyer-seller relationship is an atmosphere of "good faith." In keeping with this, the following underlying principles have been accepted as necessary to the maintenance of amicable dealings:

1. Sellers must use due diligence to ascertain that shipments consist of properly packed stock and that shipment is made during the period specified.
2. Arbitrary rejections, deductions and cancellations by the buyer are counter to acceptable good trade practice.
3. Shippers must guarantee the quality of all stock shipped but shall not warrant its use or the finished product made therefrom.

Each transaction covering the purchase or sale of materials described in this circular should be confirmed in writing and include agreement on the following items:

1. QUANTITY: If the terms "more or less" or "about" or similar terms are used, it is understood that delivery may be for a variance of 10% on the specified commodity.
   A. A contract for a carload unless otherwise agreed upon, shall mean the minimum quantity recognized by the official classification tariff of the district in which the seller is located.
   B. A short ton shall be understood to be 2,000 lbs. A metric ton shall be understood to be 2204.6 lbs. A long ton shall be understood to be 2240 lbs.
2. PROMPT shipping instructions means shipment within fourteen days of order date unless otherwise agreed upon between buyer and seller. IMMEDIATE shipping instructions means shipment within five days of order date unless otherwise agreed upon between buyer and seller.
3. All deliveries shall be as represented by the seller. Any delivery containing in excess of the specified amount of rejections may, at the buyer's option, be rejected or with seller's approval assorted and the objectionable excess material may be taken to account at market price or returned.
4. All merchandise to be weighed over tested scales and detailed weight notes to be furnished with invoices.
5. MOISTURE in excess of the natural content is not allowable. If excess moisture content is found, it gives the buyer the right to rejection or price adjustment with the approval of the seller.
6. Terms shall be as agreed between buyer and seller.
7. Tare weight not to exceed 3%.

NEW CUTTINGS

All grades as defined herein must be clean, dry and free of rubber, leather, slasher, wool, silk, rayon, wood, paper, muss, pasted stock, adhesives, masking tape, plastics, paint, acetate, grease, oil, paraffin, latex, waterproofed materials or synthetic materials and any other foreign materials, unless otherwise specified.

The specifications for some of the grades listed below indicate specific exclusion of synthetic fibers and other injurious materials to the papermaking process. They are mentioned in the particular specifications for emphasis and because the particular grades are more susceptible to such foreign material. However, the limitations in the foregoing paragraph are applicable, not only to the grades for which the specific limitations are mentioned, but also to all of the grades when referred to in sales for use in writing paper mills.

Specifications for Grades

1. No. 1 WHITE SHIRT CUTTINGS AND/OR BLEACHED WHITE DUCK CUTTINGS: Table cuttings of white shirts, b.v.d.'s, bleached twill, drill or duck materials, accumulated from shirt factories or other garment factories, free of color, starched or loaded materials and lawns.
2. WHITE TERRY COTTON, free of synthetics, colors, and colored thread.
3. WHITE SHRUNK CUTTINGS AND/OR HEADINGS: White cuttings and/or headings which may be loaded or starched, but free of wiggin or buckram.
4. No. 1 UNBLEACHED MUSLIN CUTTINGS: Table cuttings of unbleached materials of sheeting, drill, twill, or muslin construction; the packing must be free of unbleachable colored selvages, starched or loaded cuttings, canton flannel glove cuttings, heavily shived materials, heavy canvas, osnaburgs and thrums.
5. No. 1 UNBLEACHED HEADINGS: Headings of unbleached materials of sheeting, drill, twill or muslin construction; the packing must be free of unbleachable colored selvages, starched or loaded cuttings, canton flannel glove cuttings, heavily shived materials, heavy canvas, osnaburgs and thrums.
6. No. 1 UNBLEACHED THRUMS: New unbleached strips, mill stock with threads attached and may contain mill and weaver knots but must be free of slasher and unbleachable colored selvages.
7. HEAVY UNBLEACHED CANVAS CUTTINGS: Heavy unbleached canvas cuttings, with or without colored stripes.
8. OSNABURG CUTTINGS: The same materials defined in No. 1 Unbleached Cuttings, except that they may contain shivy cuttings.

9. **BLEACHED FLANNEL CUTTINGS AND/OR HEADINGS:** Table cuttings of bleached canton flannel or flannelette linings and/or headings.
10. **UNBLEACHED FLANNEL CUTTINGS:** Table cuttings of unbleached flannel or flannelette linings and/or headings.
11. **No. 1 BLEACHED SHOE CUTTINGS:** Table cuttings of bleached materials from shoe linings. This material may be starched or drilled or fleece-backed, but free of pasted stock.
12. **HEAVY DRILL UNBLEACHED SHOE CUTTINGS:** Table cuttings of unbleached materials from shoe linings which may be starched, but which must be free of fleece-backed shoe cuttings, and pasted stock.
13. **UNBLEACHED SHOE CUTTINGS:** Table cuttings of unbleached fleece-backed materials from shoe linings which may be starched; the packing may contain heavy drill unbleached shoe cuttings, but must be free of pasted stock.
14. **UNBLEACHED CANTON FLANNEL GLOVE CUTTINGS:** Table cuttings of unbleached material accumulated by cotton or canvas glove factories, and which must be free of colored stock.
15. **STRIPED GLOVE CUTTINGS:** Glove cuttings of various colored stripes.
16. **TAN AND/OR GREY GLOVE CUTTINGS:** Table cuttings of tan and/or grey glove materials, free of all other colors.
17. **WINE BROWN JERSEY GLOVE CUTTINGS:** Table cuttings of wine brown jersey gloves, free of all other colors.
18. **No. 1 LIGHT FLANNELETTES:** Pastel and light printed flannelette table cuttings.
19. **TAN KASHA:** Only tan interlinings of coats.
20. **No. 1 PERCALES:** Table cuttings of light colored print rags from shirts, shorts and pajamas; the packing may contain bleachable solid colors but must be free of woven materials and dark colors.
21. **No. 1 LIGHT PRINTS:** Printed table cuttings of ladies' garments; the packing may contain bleachable solid colors but must be free of woven materials.
22. **WHITE-BACK BLEACHABLE BLUE DENIMS:** Table cuttings of white-back blue overall materials only. The packing must be free of colored threads and thrums. They must be bleachable.
23. **BLUE DENIMS:** New white-back blue overall, express-striped blue overall or bleachable blue overall cuttings. The packing must be free of colored threads and thrums.
24. **BLUE DENIM THRUMS:** New white-back blue overall, express-striped blue overall or bleachable blue overall strips, mill rags with threads attached. The packing may contain mill and weaver knots but must be free of slasher.
25. **VAT DYE DENIMS:** Table cuttings of blue overall materials that are not bleachable.
26. **MIXED SPORT DENIMS:** Table cuttings of all denim materials, weights and colors, free of synthetics.
27. **INDIGO BLUE CUTTINGS:** Table cuttings of indigo blue twills and drills.
28. **GREY CHEVIOTS:** Table cuttings of grey cheviot shirt materials.
29. **BLUE CHAMBRAY CUTTINGS:** Table cuttings of blue chambray materials.
30. **TICKING CUTTINGS(MATTRESS CUTTINGS):** Table cuttings of light colored mattress cuttings which must be free of feathers, hair, metallic substances, dark colored materials and treated materials.
31. **FANCY SHIRT CUTTINGS:** Table cuttings of woven and printed cotton materials accumulated from shirt factories.
32. **No. 1 WASHABLES:** Colored cuttings in print or solid colors. Woven materials may be included.
33. **SUN TAN KHAKI CUTTINGS:** Table cuttings from pants and shirting materials of sun tan shades.
34. **GREY CHINO CUTTINGS:** Table cuttings from pants and shirting materials of grey twill and drill.
35. **HERRINGBONE GREEN TWILL CUTTINGS:** Table cuttings of herringbone green twill materials.
36. **MIXED KHAKI CUTTINGS:** Table cuttings of any and all shades of khaki cuttings.
37. **CORDUROY CUTTINGS:** Table cuttings from corduroy garments free of cottonades.
38. **COTTONADES:** Table cuttings of all work garments or similar materials of all colors, free of unions.
39. **NEW ROOFING CUTTINGS:** Consisting of a mixture of cuttings, any and all colors from garments of rayon, silk, synthetic fibers, cotton, wool, or a mixture of any or all of the above mentioned fibers. Not guaranteed free of rubber.
40. **COLORED SYNTHETIC CUTTINGS:** Consisting of a mixture of cuttings, any and all colors, from garments of rayon, silk, cotton or synthetic fibers but must be free of wool, haircloth and metallic fibers.
41. **BLEACHED UNDERWEAR CUTTERS (FREE OF FLEECE-LINED CUTTERS):** Table cuttings of bleached underwear, free of trimmings, noodles, seamers, and synthetic materials.
42. **BLEACHED UNDERWEAR CUTTERS (WITH FLEECE-LINED CUTTERS):** Table cuttings of bleached underwear, free of trimmings, noodles, seamers and synthetic materials.
43. **UNBLEACHED OR EGYPTIAN UNDERWEAR CUTTERS (FREE OF FLEECE-LINED CUTTERS):** Table cuttings of unbleached underwear, free of trimmings, noodles, seamers and synthetic materials.
44. **UNBLEACHED OR EGYPTIAN UNDERWEAR CUTTERS (WITH FLEECE-LINED CUTTERS):** Table cuttings of unbleached underwear, free of trimmings, noodles, seamers and synthetic materials.
45. **BLEACHABLE PASTEL UNDERWEAR CUTTERS:** Table cuttings of bleachable pastel shades of underwear, free of trimmings, noodles, loopers, seamers and synthetic materials.
46. **COLORED TERRY COTTON:** Free of synthetics.

47. SILVER GREY OR RANDOM UNDERWEAR CUTTERS(FREE OF FLEECE-LINED CUTTERS): Table cuttings of bleachable silver grey or random underwear cutters, free of trimmings, noodles, loopers, seamers and synthetic materials.
48. MIXED SILVER GREY AND/OR RANDOM CUTTERS: Table cuttings of bleachable silver grey or random underwear cutters, free of noodles, loopers, and seamers, containing fleeced and unfleeced materials.
49. DARK COLORED KNITTED UNDERWEAR CUTTERS: Table cuttings of solid colored underwear or knitted materials, which must be free of seamers.
50. JAZZ CUTTERS: Table cuttings of striped and/or solid colored underwear or knitted materials, which must be free of seamers.
51. BLEACHED UNDERWEAR SEAMERS (FREE OF FLEECE-LINED): Bleached trimmings from underwear, may contain facings.
52. MIXED BLEACHED AND UNBLEACHED UNDERWEAR SEAMERS: White and unbleached trimmings from underwear.
53. PASTEL UNDERWEAR SEAMERS: Pastel trimmings from underwear.
54. DARK COLORED UNDERWEAR SEAMERS: Colored trimmings from underwear.
55. UNBLEACHED LOOPERS AND PIECES: Unbleached hosiery loopers and pieces.
56. WHITE OR CREAM LINEN CUTTINGS: Table cuttings of white or cream materials, woven from flax, free of colored selvages.
57. GREY OR UNBLEACHED LINEN CUTTINGS: Table cuttings of grey or unbleached materials, woven from flax, free of red selvages.
58. WHITE OR CREAM LINEN CUTTINGS WITH COLORED SELVAGES: Table cuttings of white or cream colored materials, woven from flax, with colored selvages.
59. GREY OR UNBLEACHED LINEN CUTTINGS WITH COLORED SELVAGES: Table cuttings of grey or unbleached materials, woven from flax, with colored selvages.
60. COLORED LOOPERS AND PIECES: Colored hosiery loopers and pieces.
61. OLIVE GREEN COTTON SATEEN: Free of treated and/or synthetic materials.

OLD RAGS

Specifications for Grades

62. No. 1 WHITES (REPACKED): Clean white cotton rags, free of curtains, canvas and colored rags, must not contain mussy or stringy rags or wiper trimmings.
63. MIXED WHITES (REPACKED): Clean and soiled white cotton rags, commercially free of any dump rags, street rags, scorched rags, must not contain wiper trimmings.
64. WHITE WIPER TRIMMINGS: Shall consist of white cotton trimmings, commercially free of synthetics, can contain rags with buttons and metal.
65. COLORED WIPER TRIMMINGS: Shall consist of colored cotton trimmings, commercially free of synthetics, can contain rags with buttons and metal.
66. BLUES AND MIXED WHITES (REPACKED): Consists of Mixed Whites (repacked) and Blues (repacked). Rags strictly of house collection. Shall not contain old corsets, socks, stockings or new cuttings, must be free of rubberized materials and plastics.
67. BLUES (REPACKED): Rags strictly of house collection. Shall not contain old corsets, socks, stockings or new cuttings, must be free of rubberized materials and plastics.
68. OLD COTTON PANTS: Shall consist of all complete cotton garments, commercially free of oil, rubber, leather, grease, paint, miner's garments, strips, skeleton garments or synthetics.
69. MIXED COTTON PANTS AND OVERALLS: Shall consist of all complete cotton garments, commercially free of oil, rubber, leather, grease, paint, miner's garments, strips, skeleton garments or synthetics.
70. OLD BLUE OVERALLS: Shall contain only blue overalls consisting of complete cotton garments, commercially free of oil, rubber, leather, grease, paint, miner's garments, strips, skeleton garments or synthetics.
71. COTTON FILLED QUILTS: Quilts consisting of cotton only, commercially free of wool, synthetics, metallics, rubber and plastics.
72. COTTON PANTS TOPS: Shall consist of square cut cotton pants tops without legs, commercially free of oil, rubber, leather, grease, paint, miner's garments, strips, skeleton garments or synthetics.
73. BLUE OVERALL TOPS: Shall contain only square cut blue cotton overall tops, commercially free of oil, rubber, leather, grease, paint, miner's garments, strips, skeleton garments or synthetics.
74. MIXED INSTITUTION RAGS: Shall consist of all items of discarded clothing and household textiles, in whatever condition, except those items removed for sale as clothing in the retail store of the institution. Mixed Institution Rags shall not contain American flags, carpets, rugs, stuffed toys, cotton pillows, mattresses, rubberized materials, plastic materials, cattle hair pads, belts, fiber glass items, or any items of any nature not considered in the textile category. No other items shall be removed from "honest" mixed institution rags that will cause the mixed rags to be reduced in value.

Official Copies of this Classification always carry the Association's Seal

(Printed on Recycled Paper)

NARI CIRCULAR NF-80

Standard Classifications

For

Nonferrous Scrap Metals

EFFECTIVE JULY 1, 1980

National Association of Recycling Industries, Inc.
330 Madison Avenue, New York City, N. Y. 10017

CODE WORD ITEM

Apple 1.—DELIVERY

a. Delivery of more or less on the specified quantity up to 1¼ per cent is permissible.

b. If the term "about" is used, it is understood that 5 per cent more or less of the quantity may be delivered.

c. Should the seller fail to make deliveries as specified in the contract the purchaser has the option of cancelling all of the uncompleted deliveries or holding the seller for whatever damages the purchaser may sustain through failure to deliver and if unable to agree on the amount of damages, an Arbitration Committee of the National Association of Recycling Industries, Inc. may be appointed for this purpose, to determine the amount of such damages.

d. In the event that buyer should claim the goods, delivered on a contract, are not up to the proper standard, and the seller claims that they are a proper delivery, the dispute may be referred to an Arbitration Committee of the National Association of Recycling Industries, Inc. to be appointed for that purpose.

e. A carload, unless otherwise designated, shall consist of the weight governing the minimum carload weight at the lowest carload rate of freight in the territory in which the seller is located. If destination of material requires a greater carload minimum weight, buyer must so specify.

f. A ton shall be understood to be 2,000 pounds unless otherwise specified. On material purchased for export shipment a ton shall be specified as either a Gross Ton of 2240 lbs., or a Metric Ton of 2204.6 lbs.

g. If, through embargo, a delivery cannot be made at the time specified, the contract shall remain valid, and shall be completed immediately on the lifting of the embargo, and terms of said contract shall not be changed. When shipments for export for which space has been engaged have been delivered or tendered to a steamship for forwarding and through inadequacy of cargo space the steamship cannot accept the shipment, or where steamer is delayed in sailing beyond its scheduled time, shipment on the next steamer from the port of shipment shall be deemed a compliance with the contract as to time of shipment.

h. In case of a difference in weight and the seller is not willing to accept buyer's weights, a sworn public weigher shall be employed and the party most in error must pay the costs of handling and reweighing.

i. When material is such that it can be sorted or segregated, consignee cannot reject the entire shipment if the percentage of the rejection does not exceed 10%. The rejected material must be located in such a manner that it can be readily sorted or segregated. The disposition of the rejected material, including the cost of sorting, packaging, and reloading to be subject to negotiation between buyer and seller. Seller is responsible for freight costs on rejected material. Replacement of, or financial adjustment for rejected material, will be subject to mutual agreement between buyer and seller.

Upon request of the shipper, rejections shall be returnable to the seller on domestic shipments within 10 days and on foreign shipments within 30 days from the time notice of rejection is received by them and provided government regulations permit such return.

j. PACKAGES

Shall be good strong packages suitable for shipment and each package shall be plainly marked with separate shipping marks and numbers and with the gross and tare weights so that the packages may reach their destination and their weights can be easily checked.

Barley 2.—No. 1 COPPER WIRE

Shall consist of No. 1 bare, uncoated, unalloyed copper wire, not smaller than No. 16 B & S wire gauge. Green copper wire and hydraulically compacted material to be subject to agreement between buyer and seller.

Berry 3.—No. 1 COPPER WIRE

Shall consist of clean, untinned, uncoated, unalloyed copper wire and cable, not smaller than No. 16 B & S wire gauge, free of burnt wire which is brittle. Hydraulically briquetted copper subject to agreement.

CODE WORD ITEM

Birch 4.—No. 2 COPPER WIRE

Shall consist of miscellaneous, unalloyed copper wire having a nominal 96% copper content (*minimum* 94%) as determined by electrolytic assay. Should be free of the following: Excessively leaded, tinned, soldered copper wire; brass and bronze wire; excessive oil content, iron, and non-metallics; copper wire from burning, containing insulation; hair wire; burnt wire which is brittle; and should be reasonably free of ash. Hydraulically briquetted copper wire subject to agreement.

Candy 5.—No. 1 HEAVY COPPER

Shall consist of clean, unalloyed, uncoated copper clippings, punchings, bus bars, commutator segments, and wire not less than ⅛ of an inch thick, free of burnt wire which is brittle; but may include clean copper tubing. Hydraulically briquetted copper subject to agreement.

Cliff 6.—No. 2 COPPER

Shall consist of miscellaneous, unalloyed copper scrap having a nominal 96% copper content (minimum 94%) as determined by electrolytic assay. Should be free of the following: Excessively leaded, tinned, soldered copper scrap; brasses and bronzes; excessive oil content, iron and non-metallics; copper tubing with other than copper connections or with sediment; copper wire from burning, containing insulation; hair wire; burnt wire which is brittle; and should be reasonably free of ash. Hydraulically briquetted copper subject to agreement.

Clove 7.—No. 1 COPPER WIRE NODULES

Shall consist of No. 1 bare, uncoated, unalloyed copper wire scrap nodules, chopped or shredded, free of tin, lead, zinc, aluminum, iron, other metallic impurities, insulation, and other foreign contamination. Minimum copper 99%. Gauge smaller than No. 16 B & S wire and hydraulically compacted material subject to agreement between buyer and seller.

Cobra 8.—No. 2 COPPER WIRE NODULES

Shall consist of No. 2 unalloyed copper wire scrap nodules, chopped or shredded, minimum 97% copper. Maximum metal impurities not to exceed .50% aluminum and 1% each of other metals or insulation. Hydraulically compacted material subject to agreement between buyer and seller.

Cocoa 9.—COPPER WIRE NODULES

Shall consist of unalloyed copper wire scrap nodules, chopped or shredded, minimum 99% copper. Shall be free of excessive insulation and other non-metallics. Maximum metal impurities as follows:

Aluminum	—	.05%
Tin	—	.25%
Nickel	—	.05%
Antimony	—	.01%
Iron	—	.05%

Hydraulically compacted material subject to agreement between buyer and seller.

Dream 10.—LIGHT COPPER

Shall consist of miscellaneous, unalloyed copper scrap having a nominal 92% copper content (minimum 88%) as determined by electrolytic assay and shall consist of sheet copper, gutters, downspouts, kettles, boilers, and similar scrap. Should be free of the following: Burnt hair wire; copper clad; plating racks; grindings; copper wire from burning, containing insulation; radiators; fire extinguishers; refrigerator units; electrotype shells; screening; excessively leaded, tinned, soldered scrap; brasses and bronzes; excessive oil, iron and non-metallics; and should be reasonably free of ash. Hydraulically briquetted copper subject to agreement. Any items excluded in this grade are also excluded in the higher grades above.

Drink 11.—REFINERY BRASS

Shall contain a minimum of 61.3% copper and maximum 5% iron and to consist of brass and bronze solids and turnings, and alloyed and contaminated copper scrap. Shall be free of insulated wire, grindings, electrotype shells and non-metallics. Hydraulically briquetted material subject to agreement.

CODE WORD ITEM

Drove 12.—COPPER-BEARING SCRAP

Shall consist of miscellaneous copper-containing skimmings, grindings, ashes, irony brass and copper, residues and slags. Free of insulated wires; copper chlorides; unprepared tangled material; large motors; pyrophoric material; asbestos brake linings; furnace bottoms; high lead materials; graphite crucibles; and noxious and explosive materials. Fine powdered material by agreement. Hydraulically briquetted material subject to agreement.

Druid 13.—INSULATED COPPER WIRE SCRAP

Shall consist of copper wire scrap with various types of insulation. To be sold on a sample or recovery basis, subject to agreement between buyer and seller.

Ebony 14.—COMPOSITION OR RED BRASS

Shall consist of red brass scrap, valves, machinery bearings and other machinery parts, including miscellaneous castings made of copper, tin, zinc, and/or lead. Should be free of semi-red brass castings (78% to 81% copper); railroad car boxes and other similar high-lead alloys; cocks and faucets; closed water meters; gates; pot pieces; ingots and burned brass; aluminum, silicon, and manganese bronzes; iron and non-metallics. No piece to measure more than 12" over any one part or weigh over 100 lbs.

Enerv 15.—RED BRASS COMPOSITION TURNINGS

Shall consist of turnings from red brass composition material and should be sold subject to sample or analysis.

Elder 16.—GENUINE BABBITT-LINED BRASS BUSHINGS

Shall consist of red brass bushings and bearings from automobiles and other machinery, shall contain not less than 12% high tin base babbitt, and shall be free of iron-backed bearings.

Eland 17.—HIGH GRADE — LOW LEAD BRONZE SOLIDS

It is recommended these materials be sold by analysis.

Elbow 18.—BRONZE PAPER MILL WIRE CLOTH

Shall consist of clean genuine Fourdrinier wire cloth and screen having a minimum copper content of 87%, minimum tin content of 3%, and a maximum lead content of 1%, free of stainless steel and Monel metal stranding.

Elias 19.—HIGH LEAD BRONZE SOLIDS AND BORINGS

It is recommended that these materials be sold on sample or analysis.

Engel 20.—MACHINERY OR HARD BRASS SOLIDS

Shall have a copper content of not less than 75%, a tin content of not less than 6%, and a lead content of not less than 6%—nor more than 11%, and total impurities, exclusive of zinc, antimony, and nickel of not more than 0.75%; the antimony content not to exceed 0.50%. Shall be free of lined and unlined standard red carboxes.

Erin 21.—MACHINERY OR HARD BRASS BORINGS

Shall have a copper content of not less than 75%, a tin content of not less than 6%, and a lead content of not less than 6%—nor more than 11%, and the total impurities, exclusive of zinc, antimony, and nickel of not more than 0.75%; the antimony content not to exceed 0.50%.

Fence 22.—UNLINED STANDARD RED CAR BOXES (CLEAN JOURNALS)

Shall consist of standard unlined and/or sweated railroad boxes and unlined and/or sweated car journal bearings, free of yellow boxes and iron-backed boxes.

Ferry 23.—LINED STANDARD RED CAR BOXES (LINED JOURNALS)

Shall consist of standard babbitt-lined railroad boxes and/or babbitt-lined car journal bearings, free of yellow boxes and iron-backed boxes.

Grape 24.—COCKS AND FAUCETS

Shall consist of mixed clean red and yellow brass, including chrome or nickel-plated, free of gas cocks, beer faucets, and aluminum and zinc base die cast material, and to contain a minimum of 35% semi-red.

CODE WORD ITEM

Greet 25.—MIXED BRASS SCREENS

To consist of clean mixed-copper, brass and bronze screens, and to be free of excessively dirty and painted material.

Honey 26.—YELLOW BRASS SCRAP

Shall consist of brass castings, rolled brass, rod brass, tubing and miscellaneous yellow brasses, including plated brass. Must be free of manganese-bronze, aluminum-bronze, unsweated radiators or radiator parts, iron, excessively dirty and corroded materials.

Ivory 27.—YELLOW BRASS CASTINGS

Shall consist of yellow brass castings in crucible shape, no piece to measure more than 12 inches over any one part; and shall be free of brass forgings, silicon bronze, aluminum bronze and manganese bronze, and not to contain more than 15% nickel plated material.

Knife 28.—OLD ROLLED BRASS

Shall consist of old pieces of yellow sheet brass and yellow light tubing brass, free from solder, tinned and nickel plated material, iron, paint and corrosion, rod brass and condenser tubes.

Label 29.—NEW BRASS CLIPPINGS

Shall consist of the cuttings of new unleaded yellow brass sheet or plate, to be clean and free from foreign substances and not to contain more than 10% of clean brass punchings under ¼ inch. To be free of Muntz metal and naval brass.

Lace 30.—BRASS SHELL CASES WITHOUT PRIMERS

Shall consist of clean fired 70/30 brass shell cases free of primers and any other foreign material.

Lady 31.—BRASS SHELL CASES WITH PRIMERS

Shall consist of clean fired 70/30 brass shell cases containing the brass primers and which contain no other foreign material.

Lake 32.—BRASS SMALL ARMS AND RIFLE SHELLS, CLEAN FIRED

Shall consist of clean fired 70/30 brass shells free of bullets, iron and any other foreign material.

Lamb 33.—BRASS SMALL ARMS AND RIFLE SHELLS, CLEAN MUFFLED (POPPED)

Shall consist of clean muffled (popped) 70/30 brass shells free of bullets, iron and any other foreign material.

Lark 34.—YELLOW BRASS PRIMER

Shall consist of clean yellow brass primers, burnt or unburnt. Free of iron, excessive dirt, corrosion and any other foreign material.

Maize 35.—MIXED NEW NICKEL SILVER CLIPPINGS

Shall consist of one or more nickel silver alloys and the range of nickel content to be specified, free of chrome or any other plating material. Leaded nickel silver clippings should be packed and sold separately. Not to contain more than 10% of clean punchings under ¼ inch.

Major 36.—NEW NICKEL SILVER CLIPPINGS AND SOLIDS

Shall consist of new, clean nickel silver clippings, plate, rod and forgings, and other rolled shapes, free of chrome or any other plating material. Must be sold on nickel content specifications such as 10% — 12% — 15% — 18% — 20%. Leaded nickel silver clippings should be packed and sold separately. A description as to its physical characteristics should be made in offering all nickel silver material.

Malar 37.—NEW SEGREGATED NICKEL SILVER CLIPPINGS

Shall consist of one specified nickel silver alloy. Not to contain more than 10% of clean punchings under ¼ inch.

CODE WORD ITEM

Malic 38.—OLD NICKEL SILVER

Shall consist of old nickel silver sheet, pipe, rod, tubes, wire, screen, soldered or unsoldered. Must not be trimmed seams alone and it is also to be free of foreign substances, iron rimmed material or other metals.

Melon 39.—BRASS PIPE

Shall consist of brass pipe free of plated and soldered materials or pipes with cast brass connections. To be sound, clean pipes free of sediment and condenser tubes.

Naggy 40.—NICKEL SILVER CASTINGS

To be packed and sold separately.

Niece 41.—NICKEL SILVER TURNINGS

To be sold by sample or analysis.

Night 42.—YELLOW BRASS ROD TURNINGS

Shall consist of strictly rod turnings, free of aluminum, manganese, composition, Tobin and Muntz metal turnings; not to contain over 3% free iron, oil or other moisture; to be free of grindings and babbitts; to contain not more than 0.30% tin and not more than 0.15% alloyed iron.

Noble 43.—NEW YELLOW BRASS ROD ENDS

Shall consist of new, clean rod ends from free turning brass rods or forging rods, not to contain more than 0.30% tin and not more than 0.15% alloyed iron. To be free of Muntz metal and naval brass or any other alloys. To be in pieces not larger than 12" and free of foreign matter.

Nomad. 44.—YELLOW BRASS TURNINGS

Shall consist of yellow brass turnings, free of aluminum, manganese and composition turnings; not to contain over 3% of free iron, oil or other moisture; to be free of grindings and babbitts. To avoid dispute, to be sold subject to sample or analysis.

Ocean 45.—MIXED UNSWEATED AUTO RADIATORS

Shall consist of mixed automobile radiators, to be free of aluminum radiators and iron finned radiators. All radiators to be subject to deduction of actual iron. The tonnage specification should cover the gross weight of the radiators, unless otherwise specified.

Pales 46.—ADMIRALTY BRASS CONDENSER TUBES

Shall consist of clean sound Admiralty condenser tubing which may be plated or unplated, free of nickel alloy, aluminum alloy, and corroded material.

Pallu 47.—ALUMINUM BRASS CONDENSER TUBES

Shall consist of clean sound condenser tubing which may be plated or unplated, free of nickel alloy and corroded material.

Palms 48.—MUNTZ METAL TUBES

Shall consist of clean sound Muntz metal tubing which may be plated or unplated, free of nickel alloy, aluminum alloy, and corroded material.

Pants 49.—PLATED ROLLED BRASS

Shall consist of plated brass sheet, pipe, tubing, and reflectors, free of soldered, tinned, corroded, and aluminum painted material, Muntz metal and Admiralty tubing, and material with cast brass connections.

Parch 50.—MANGANESE BRONZE SOLIDS

Shall have a copper content of not less than 55%, a lead content of not more than 1%, and shall be free of aluminum bronze and silicon bronze.

Racks 51.—SCRAP LEAD — SOFT

Shall consist of clean soft scrap lead, free of all foreign materials such as drosses, battery lead, lead covered cable, hard lead, collapsible tubes, foil, type metals, zinc, iron and brass fittings, dirty chemical lead. Free of radioactive materials.

CODE WORD ITEM

Radio 52.—MIXED HARD/SOFT SCRAP LEAD

Shall consist of clean lead solids, free of foreign materials, such as drosses, battery lead, lead covered cable, collapsible tubes, type metals, zinc, iron and brass fittings, dirty chemical lead. Free of radioactive materials.

Rails 53.—BATTERY PLATES

If cells (plates, separators, and lugs) or battery plates, must be reasonably free of rubber. May be bought and sold by assay or as agreed between buyer and seller.

Rains 54.—DRAINED WHOLE BATTERIES

Batteries to be free of liquid and extraneous material content. Aircraft (aluminum or steel cased) and other special batteries subject to special agreement.

Rakes 55.—BATTERY LUGS

Shall be free from battery plates, rubber and foreign material. A minimum of 97% metallic content is required.

Ranks 56.—PEWTER

Shall consist of tableware and soda-fountain boxes but should contain a minimum of 84% tin. Siphon tops to be accounted for separately. Material must be free of brass, zinc, and other foreign metals.

Ranch 57.—BLOCK TIN

Block Tin must assay minimum of 98% tin, and to be free of liquids, solder, and brass connections, pewter, pumps, pot pieces, dirt.

Raves 58.—HIGH TIN BASE BABBITT

Shall contain a minimum of 78% tin and be free of brassy or zincy metals.

Relay 59.—LEAD COVERED COPPER CABLE

Free of armored covered cable, and foreign material.

Rents 60.—LEAD DROSS

Should be clean and reasonably free of foreign matter, iron, dirt, harmful chemicals or other metals. Free of radioactive materials. Assay basis, or as agreed between buyer and seller. Other metals present such as antimony, tin, etc. to be accounted for as agreed between buyer and seller.

Ropes 61.—LEAD WEIGHTS

May consist of lead balances with or without iron, as may be specified. Free of foreign materials.

Roses 62.—MIXED COMMON BABBITT

Shall consist of lead base bearing metal containing not less than 8% tin, free from Allens metal, ornamental, antimonial and type metal. Must be free from all zincy and excessive copper in the alloy.

Saves 63.—OLD ZINC DIE CAST SCRAP

Shall consist of miscellaneous old zinc base die castings, with or without iron and other foreign attachments. Must be free of borings, turnings, dross pieces, chunks, melted pieces and skimmings. All unmeltables, dirt, foreign attachments, and volatile substances (such as rubber, cork, plastic, grease, etc.) are deductible. Material containing in excess of 30% iron will not constitute good delivery.

Scabs 64.—NEW ZINC DIE CAST SCRAP

Shall consist of new or unused, clean, zinc base die castings. Castings to be unplated, unpainted, and free from corrosion.

Scope 65.—NEW PLATED ZINC DIE CAST SCRAP

Shall consist of new or unused clean, plated zinc base die castings, free from corrosion.

Scoot 66.—ZINC DIE CAST AUTOMOTIVE GRILLES

Shall consist of clean, old or used zinc base die cast automotive grilles, free from soldered material. All foreign attachments and extraneous materials are deductible.

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Score 67.—OLD SCRAP ZINC

Shall consist of clean dry scrap zinc, such as sheets, jar lids, clean unalloyed castings and anti-corrosion plates. Borings and turnings are not acceptable. Material must not be excessively corroded or oxidized. All foreign attachments and extraneous materials are deductible.

Screen 68.—NEW ZINC CLIPPINGS

Shall consist of any new pure zinc sheets or stampings free from corrosion. To contain no foreign material or attachments. Printers zinc, such as engravers zinc, lithograph sheets and addressograph plates subject to special arrangements. Printers zinc to be free of routings.

Scull 69.—ZINC DIE CAST SLABS OR PIGS

Shall consist of melted zinc base die cast materials, in smooth clean solid slabs or pigs. Material to be free from drosses and to contain a minimum zinc content of 90%. To contain a maximum of 0.1% nickel and maximum of 1% lead. Blocks are acceptable upon mutual agreement.

Scribe 70.—CRUSHED CLEAN SORTED FRAGMENTIZERS DIE CAST SCRAP, AS PRODUCED FROM AUTOMOBILE FRAGMENTIZERS

To be clean, free of dirt, oil, glass, rubber, and trash. To contain a maximum of 5% unmeltables such as free iron, copper, aluminum and other metals.

Scroll 71.—UNSORTED FRAGMENTIZERS DIE CAST SCRAP

Material to contain 65% zinc-bearing scrap. Trash, dirt, glass, rubber, oil, iron and other unmeltables not to exceed 5%. Quality to be determined by mutual agreement between buyer and seller.

Scrub 72.—HOT DIP GALVANIZERS SLAB ZINC DROSS (Batch Process)

Shall consist only of galvanizers unsweated zinc dross in slab form from hot dip galvanizing (Batch Process) with a minimum zinc content of 92% and shall be free of skimmings and tramp iron. Broken pieces under 2" in diameter shall not exceed 10% of the weight of each shipment. Slabs shall not weigh over 100 pounds each. Heavier pieces acceptable upon mutual agreement between buyer and seller. Material from continuous galvanizing operation is not acceptable. Blocks are acceptable upon mutual agreement.

Seal 73.—CONTINUOUS LINE GALVANIZING SLAB ZINC TOP DROSS

Shall consist of unsweated zinc dross removed from the top of a continuous line galvanizing bath, in slab form not weighing in excess of 100 pounds each, with a minimum zinc content of 90%. Heavier pieces acceptable upon mutual agreement between buyer and seller. Shall be free of skimmings. Broken pieces under 2" in diameter shall not exceed 10% of the weight of each shipment.

Seam 74.—CONTINUOUS LINE GALVANIZING SLAB ZINC BOTTOM DROSS

Shall consist of unsweated zinc dross removed from the bottom of a continuous line galvanizing bath, in slab form not weighing in excess of 100 pounds each, with a minimum zinc content of 92%. Heavier pieces acceptable upon mutual agreement between buyer and seller. Shall be free of skimmings. Broken pieces under 2" in diameter shall not exceed 10% of the weight of each shipment.

Shelf 75.—PRIME ZINC DIE CAST DROSS

Shall consist of metal skimmed from the top of pot of molten zinc die cast metal. Must be unsweated, unfluxed, shiny, smooth, metallic and free from corrosion or oxidation. Should be poured in molds or in small mounds weighing not over 75 pounds each. Zinc shall be minimum of 85%.

ANY OTHER GRADES OF ZINC-BEARING MATERIALS NOT MENTIONED ARE SUBJECT TO SPECIAL ARRANGEMENT.

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Table 76.—NEW PURE ALUMINUM CLIPPINGS

Shall consist of new, clean, unalloyed sheet, clippings and/or aluminum sheet cuttings, free from oil and grease, foil and any other foreign substances and from punchings less than ½" in size.

Taboo 77.—MIXED LOW COPPER ALUMINUM CLIPPINGS AND SOLIDS

Shall consist of new, clean, uncoated and unpainted low copper aluminum scrap of two or more alloys and to be free of 7000 series, foil, hair wire, wire screen, dirt, and other foreign substances. Grease and oil not to total more than 1%. Also free from punchings less than ½" in size. New can stock subject to arrangement between buyer and seller.

Tabor 78.—MIXED OLD ALLOY SHEET ALUMINUM

Shall consist of clean old alloy sheet aluminum of two or more alloys and to be free of 7000 series, foil, venetian blinds, castings, hair wire, screen wire, food or beverage containers, pie plates, dirt, and other foreign substances. Oil and grease not to total more than 1%. Up to 10% painted sidings and awnings permitted.

Taint 79.—SCRAP SHEET AND SHEET UTENSIL ALUMINUM

Shall consist of clean, unpainted old 2S or 3S aluminum sheet and sheet utensils, free from hub caps, radiator shells, airplane sheet, foil, food or beverage containers, pie plates, oil cans and bottle caps, dirt, and other foreign substances. Oil and grease not to total more than 1%.

Take 80.—NEW ALUMINUM CAN STOCK

Shall consist of new low copper aluminum can stock and clippings, clean, lithographed or not lithographed, and coated with clear lacquer but free of lids with sealers, iron, dirt and other foreign contamination. Oil not to exceed 1%.

Talc 81.—OLD CAN STOCK

Shall consist of clean old aluminum cans, decorated or clear, free of iron, dirt, liquid and/or other foreign contamination.

Tale 82.—PAINTED SIDING

Shall consist of clean, low copper aluminum siding scrap, painted one or two sides, free of iron, dirt, corrosion, fiber backing or other types of foreign contamination.

Talent 83.—COATED SCRAP

Shall consist of awnings, venetian blinds, vinyl, plastic, etc. Shall be subject to special arrangements between buyers and sellers.

Talk 84.—ALUMINUM COPPER RADIATORS

Shall consist of clean aluminum and copper radiators, and/or aluminum fins on copper tubing, free of brass tubing, iron and other foreign contamination.

Tall 85.—E. C. ALUMINUM NODULES

Shall consist of clean E. C. aluminum, chopped or shredded, free of screening, hair-wire, iron, insulation, copper and other foreign contamination. Must be free of minus 20 mesh material. Must contain 99.45% aluminum content.

Talon 86.—NEW PURE ALUMINUM WIRE AND CABLE

Shall consist of new, clean, unalloyed aluminum wire or cable free from hair wire, wire screen, iron, insulation and any other foreign substance.

Taste 87.—OLD PURE ALUMINUM WIRE AND CABLE

Shall consist of old, unalloyed aluminum wire or cable containing not over 1% free oxide or dirt and free from hair wire, wire screen, iron, insulation and any other foreign substance.

Tarry 88.—ALUMINUM PISTONS

(a) Clean Aluminum Pistons

Shall consist of clean aluminum pistons to be free from struts, bushings, shafts, iron rings and any other foreign materials. Oil and grease not to exceed 2%.

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(b) Aluminum Pistons with Struts
Shall consist of clean whole aluminum pistons with struts to be free from bushings, shafts, iron rings and any other foreign materials. Oil and grease not to exceed 2%.

(c) Irony Aluminum Pistons
Should be sold on recovery basis, or by special arrangements with purchaser.

Teens 89.—SEGREGATED ALUMINUM BORINGS AND TURNINGS
Shall consist of clean, uncorroded aluminum borings and turnings of one specified alloy only and subject to deductions for fines in excess of 3% through a 20 mesh screen and dirt, free iron, oil, moisture and all other foreign materials. Material containing iron in excess of 10% and/or free magnesium or stainless steel or containing highly flammable cutting compounds will not constitute good delivery.

Telic 90.—MIXED ALUMINUM BORINGS AND TURNINGS
Shall consist of clean, uncorroded aluminum borings and turnings of two or more alloys and subject to deductions for fines in excess of 3% through a 20 mesh screen and dirt, free iron, oil, moisture and all other foreign materials. Material containing iron in excess of 10% and/or free magnesium or stainless steel or containing highly flammable cutting compounds will not constitute good delivery. To avoid dispute should be sold on basis of definite maximum zinc, tin and magnesium content.

Tense 91.—MIXED ALUMINUM CASTINGS
Shall consist of all clean aluminum castings which may contain auto and airplane castings but no ingots, and to be free of iron, dirt, brass, babbitt and any other foreign materials. Oil and grease not to total more than 2%.

Tepid 92.—WRECKED AIRPLANE SHEET ALUMINUM
Should be sold on recovery basis or by special arrangements with purchaser.

Terse 93.—NEW ALUMINUM FOIL
Shall consist of clean, new, pure, uncoated, unalloyed aluminum foil, free from anodized foil, radar foil and chaff, paper, plastics, or any other foreign materials. Hydraulically briquetted material by arrangement only.

Testy 94.—OLD ALUMINUM FOIL
Shall consist of clean, old, pure, uncoated, unalloyed aluminum foil, free from anodized foil, radar foil and chaff, paper, plastics, or any other foreign materials. Hydraulically briquetted material by arrangement only.

Thigh 95.—ALUMINUM GRINDINGS
Should be sold on recovery basis or by special arrangements with purchaser.

Thirl 96.—ALUMINUM DROSSES, SPATTERS, SPILLINGS, SKIMMINGS AND SWEEPINGS
Should be sold on recovery basis or by special arrangements with purchaser.

Throb 97.—SWEATED ALUMINUM
Shall consist of aluminum scrap which has been sweated or melted into a form or shape such as an ingot, pig or slab for convenience in shipping; to be free from corrosion, drosses or any foreign materials. Should be sold subject to sample or analysis.

Tooth 98.—SEGREGATED NEW ALUMINUM ALLOY CLIPPINGS AND SOLIDS
Shall consist of new, clean, uncoated and unpainted aluminum scrap of one specified aluminum alloy only and to be free of foil, hair wire, wire screen, dirt, and other foreign substances. Oil and grease not to total more than 1%. Also free from punchings less than ½" in size. New can stock subject to arrangement between buyer and seller.

CODE WORD ITEM

Tough 99.—MIXED NEW ALUMINUM ALLOY CLIPPINGS AND SOLIDS
Shall consist of new, clean, uncoated and unpainted aluminum scrap of two or more alloys free of 7000 series and to be free of foil, hair wire, wire screen, dirt, and other foreign substances. Oil and grease not to total more than 1%. Also free from punchings less than ½" in size. New can stock subject to arrangement between buyer and seller.

Tread 100.—SEGREGATED NEW ALUMINUM CASTINGS, FORGINGS AND EXTRUSIONS
Shall consist of new, clean, uncoated aluminum castings, forgings, and extrusions of one specified alloy only and to be free from sawings, stainless steel, zinc, iron, dirt, oil, grease and other foreign substances.

Trump 101.—ALUMINUM AUTO CASTINGS
Shall consist of all clean automobile aluminum castings of sufficient size to be readily identified and to be free from iron, dirt, brass, babbitt bushings, brass bushings, and any other foreign materials. Oil and grease not to total more than 2%.

Twang 102.—INSULATED ALUMINUM WIRE SCRAP
Shall consist of aluminum wire scrap with various types of insulation. To be sold on a sample or recovery basis, subject to agreement between buyer and seller.

Twist 103.—ALUMINUM AIRPLANE CASTINGS
Shall consist of clean aluminum castings from airplanes and to be free from iron, dirt, brass, babbitt bushings, brass bushings, and any other foreign materials. Oil and grease not to total more than 2%.

Twitch 104.—FRAGMENTIZER ALUMINUM SCRAP
(From Automobile Shredders)
The material, as received, must be dry and not to contain more than 3% maximum free zinc, 1% maximum free magnesium, and 1.5% maximum free iron and stainless. Not to contain more than a total of 5% maximum of non-metallics, of which no more than 1% shall be rubber and plastics. To be free of excessively oxidized material. Any variations to be sold by special arrangement between buyer and seller.

ITEMS NOT COVERED SPECIFICALLY IN ALUMINUM SCRAP SPECIFICATIONS SHOULD BE DISCUSSED AND SOLD BY SPECIAL ARRANGEMENTS BETWEEN BUYER AND SELLER.

Wafer 105.—MAGNESIUM CLIPS
Shall consist of clean magnesium clips in crucible size, free of copper, aluminum, and zinc flashings and excessive oil and grease. To be free of all foreign attachments.

Walnut 106.—MAGNESIUM SCRAP
Shall consist of magnesium castings, magnesium engine blocks and transmission casings, bomber and car wheels, extrusions, and sheet. Material to be free from brass and copper inserts and all foreign attachments. To be free of anodes, hollow castings and explosives. Percentages of and penalties for dirt, oil, grease, and iron to be subject to agreement between buyer and seller. Excessively large pieces to be negotiated between buyer and seller.

Wine 107.—MAGNESIUM ENGRAVER PLATES
To be free of copper, aluminum, zinc, and electrotype plates. To be clean and free of all foreign attachments. Magnesium plates shipped loose by agreement between buyer and seller.

Wood 108.—MAGNESIUM DOCKBOARDS
Shall consist of clean magnesium dockboard cut or broken to size agreed upon by buyer and seller. To be free of all foreign attachments.

World 109.—MAGNESIUM TURNINGS
It is recommended that these materials be sold by special arrangement between buyer and seller.

CODE WORD ITEM

Wrench 110.—FRAGMENTIZED MAGNESIUM SCRAP
Shall consist of clean crushed magnesium scrap free of brass, copper and other foreign material.

Aroma 111.—NEW NICKEL SCRAP
Shall consist of clean new sheet, plate, bar, tube, and any other wrought nickel scrap solids. Nickel minimum 99%. Free of castings, as well as any foreign attachments or other contamination.

Burly 112.—OLD NICKEL SCRAP
Shall consist of old and/or new sheet, plate, bar, tube, and any other wrought nickel scrap solids. Material to contain a minimum of 98% nickel. This grade to be free of castings, soldered, brazed, sweated, or painted material, other metallic coating, foreign attachments, and any other contamination.

Cache 113.—MISCELLANEOUS TYPES OF NICKEL SCRAP
Shall consist of miscellaneous types of nickel scrap, such as carbonized scrap, castings, strippings, peelings, baskets, and/or turnings. Particulars regarding physical description, assay, and packaging to be agreed on between buyer and seller.

Dandy 114.—NEW CUPRO NICKEL CLIPS AND SOLIDS
Shall consist of clean, new, segregated (normally accepted analysis grades) either 70/30, 80/20, or 90/10 cupro nickel tube, pipe, sheet, plate, or other wrought solid forms. Must be free of foreign attachments or any other contamination.

Daunt 115.—CUPRO NICKEL SOLIDS
Shall consist of old, and/or new, segregated (normally accepted analysis grades) either 70/30, 80/20, or 90/10 cupro nickel tube, pipe, sheet, plate, or other wrought solid forms. Maximum 2% sediment allowable. Any other forms of cupro nickel solids such as castings, gates, risers, spills, etc., packaged separately, may or may not be included, only upon agreement between buyer and seller. Must be free of foreign attachments and all other contamination. Other particulars concerning physical description, analysis and packaging to be agreed upon between buyer and seller.

Delta 116.—SOLDERED CUPRO NICKEL SOLIDS
Shall consist of segregated (normally accepted analysis grades) either 70/30, 80/20, or 90/10 cupro nickel solids, soldered, brazed, or sweated, must be free of trimmed seams and edges and all other contamination.

Decoy 117.—CUPRO NICKEL SPINNINGS, TURNINGS, BORINGS
Shall consist of clean segregated (normally accepted analysis grades) either 70/30, 80/20, or 90/10 cupro nickel spinnings, turnings, or borings. Particulars concerning physical description, analysis, packaging, to be agreed upon between buyer and seller.

Hitch 118.—NEW MONEL CLIPPINGS AND SOLIDS
Shall consist of clean, new, Regular and/or R-Monel sheet, plate, bar, rod, tube, pipe, or any other wrought scrap, free of any foreign attachments or any other contamination.

Ideal 119.—OLD MONEL SHEET AND SOLIDS
Shall consist of new and/or old clean Regular and/or R-Monel sheet, pipe, plate, rod, and all other wrought scrap solids. Must be free of foreign attachments or any other contamination. (To exclude soldered, brazed, and unclean sweated material.)

Indian 120.—K-MONEL RODS AND OTHER SOLIDS
Shall consist of clean K-Monel rods and other solids.

Junto 121.—SOLDERED MONEL SHEET AND SOLIDS
Shall consist of soldered and/or brazed, Regular or Miscellaneous grades of Monel Alloys (with basic minimum 63% Nickel contained in any alloy itself), in either wrought or cast form. Must be free of trimmed seams and edges, nonmetallic filling, foreign attachments, and all other contamination. Particulars concerning physical description, assay, and packaging to be agreed upon between buyer and seller.

CODE WORD ITEM

Lemon 122.—MONEL CASTINGS
Shall consist of various types of clean Monel castings, assaying minimum 60% nickel. Must be free of foreign attachments, or any other contamination.

Lemur 123.—MONEL TURNINGS
Shall consist of mixed Monel turnings and borings containing a minimum of 60% nickel content, on a dry basis.

Pekoe 124.—200 SERIES STAINLESS STEEL SCRAP SOLIDS
Shall consist of all types of clean AISI Series Stainless Steel Scrap Solids, which contain a maximum of .5% copper, free of foreign attachments and other contamination.

Sabot 125.—STAINLESS STEEL SCRAP
Shall consist of clean 18-8 type stainless steel clips and solids containing a minimum 7% nickel, 16% chrome, and have a maximum of .50% molybdenum, .5% copper, .045% phosphorous, and .03% sulfur, and otherwise free of harmful contaminants. Particulars concerning physical description, grading, additional analysis, and preparation to be agreed upon between buyer and seller.

Ultra 126.—STAINLESS STEEL TURNINGS
Shall consist of clean 18-8 type stainless steel turnings containing a minimum of 7% nickel and 16% chrome, and to be free of nonferrous metals, non-metallics, excessive iron, oil and other contaminants. Particulars concerning physical description, assay, packaging to be agreed upon between buyer and seller.

Rusten 127.—11-14% CHROME STAINLESS SCRAP
Straight chrome stainless scrap shall contain 11-14% chrome, phosphorous and sulphur .03% maximum, and shall not contain over .50% nickel and otherwise be free from harmful contaminants. Material to be prepared to individual consumer's specifications.

Rusthirty 128.—14-18% CHROME STAINLESS SCRAP
Straight chrome stainless scrap shall contain 14-18% chrome, phosphorous and sulphur .03% maximum, and shall not contain over .50% nickel and otherwise be free from harmful contaminants. Material to be prepared to individual consumer's specifications.

Vaunt 129.—EDISON BATTERIES
To be sold free of crates, copper terminal connectors, and drained free of excess liquid, to be free of type "B" batteries.

ANY OTHER PARTICULARS IN THE NICKEL ALLOY GROUP CONCERNING PHYSICAL DESCRIPTION, ASSAY, AND PACKAGING TO BE AGREED UPON BETWEEN BUYER AND SELLER.

MIXED NONFERROUS METALS FROM RESOURCE RECOVERY FACILITIES

Shall consist of mixed metals containing predominantly zinc, brass, copper, lead, aluminum and stainless steel. Metals shall be relatively free of foreign attachments and all pieces should be capable of passing over ½" mesh screen. Mixture should not contain more than 3% iron and no more than an additional 3% foreign, nonmetallic substances. Material should be loaded loosely in drums, boxes or other containers and should not be briquetted, baled or otherwise hydraulically compressed.

●

GENERAL NOTE

It has been the purpose in revising these specifications to provide for those materials which are most frequently dealt in. Any items for which classifications are not specified should be subject to negotiations between buyer and seller.

IDENTIFICATION CHECK LIST FOR PRECIOUS METALS

Because in the precious metals industry values are derived from the *exact* analysis obtained from a representative sample, it is not possible to develop a set of specifications similar to those NARI has established for other nonferrous metals.

This Identification Check List, however, for the first time sets up a general basis for identifying types and grades of precious metal scrap by the scrap processor which will be familiar both to the precious metal refiner and to the plants generating precious metal scrap.

By checking this identification list, the scrap processor gives the refiner a fairly accurate conception of the material he has on hand and offers a basis for the refiner to quote an estimated price for the material.

Though this Identification Check List is added to NARI's specification circular, it is to be cautioned that these are not specifications but are to be regarded as a guideline for scrap processors and refiners.

Due to the high value and the constantly changing character of precious metal scrap it is the practice in the industry to require a sample to be submitted before giving refining schedules.

I. SCRAP SOURCES

REFINED SILVER METAL—99.9 PLUS PERCENT

SILVER BEARING MATERIALS:

- Anodes
- Assemblies—Electrical
- Batteries
  - Silver/Copper
  - Silver/Cadmium
  - Silver/Zinc
  - Silver/Magnesium
- Blanking Scrap—Punchings
- Brazing Alloys
- Brushes—Electric Motors
- Bullion
- Chemical Salts
- Clad Bi-Metal Parts
- Coin Silver
- Contacts
- Dental Amalgam
- Film
  - Industrial X-Ray
  - Medical X-Ray
  - Lithographic
  - Photographic Negatives
- Filters—Plating
- Flake—From Hypo Solution Recovery Systems
- Hooks—Plating—Nodules
- Jewelry Sweeps
- Paints—Paste
- Paper-Reproduction
- Plated Parts—Electrical—Electronic
- Plated Serving Pieces
- Plated Utensils
- Plated Wire
- Powders—Granulated
- Punchouts
- Relays—Electrical
- Resins
- Silver Lined Bearings—Diesel Locomotives and Aircraft
- Sludges—Plating and Precipitates
- Solutions—Plating
- Sterling Silver
- Tin Lead Alloys—Contaminated
- Turnings
- Wave Guides
- Wiping Rags

REFINED GOLD METAL—99.9 PLUS PERCENT
REFINED GOLD SPONGE—99.9 PLUS PERCENT

GOLD BEARING MATERIALS:

- Brazing Alloys
- Cladmetal Parts
- Contacts
- Dental Alloys
- Dental Scrap
- Dental Sweeps and Grindings
- Diodes
- Filled Scrap
- Filters—Plating
- Flakes
- Flashings
- Foil
- Hooks—Plating—Nodules
- Jewelry Scrap
- Jewelry Sweeps and Grindings
- Paints and Paste
- Peelings
- Placer Gold
- Plated Parts—Electrical
- Plated Wire
- Powders
- Printed Circuit Boards
- Printed Circuit Boards with Components
- Punchouts
- Resins—Plating
- Salts—Chemical
- Sludges—Plating
- Solutions
- Sponge
- Tin Lead Alloys—Contaminated
- Transistors
- Wiping Rags
- Wire

REFINED PLATINUM METAL—99.9 PLUS PERCENT
REFINED PLATINUM SPONGE—99.8 PLUS PERCENT

PLATINUM BEARING MATERIALS:

- Catalysts
- Chemicals
- Clad Materials
- Contacts
- Dental Alloys
- Dental Scrap
- Dental Sweeps, Grindings
- Jewelry Scrap
- Jewelry Sweeps
- Laboratory Ware
- Magneto Points
- Powders and Paste
- Solutions—Plating
- Spark Plugs—Aircraft
- Thermocouple Wire

REFINED PALLADIUM METAL—99.8 PLUS PERCENT
REFINED PALLADIUM SPONGE—99.8 PLUS PERCENT

PALLADIUM BEARING MATERIALS:

- Catalysts
- Clad Materials
- Contact Points
- Dental Alloys
- Dental Scraps
- Dental Sweeps
- Jewelry Scrap (Sweeps)
- Paste
- Plated Parts
- Powders
- Relays—Electrical
- Salts—Chemical
- Sludges
- Solutions
- Wire

SCRAP CONTAINING COMBINATIONS OF PRECIOUS METALS (GOLD, SILVER, PLATINUM AND PALLADIUM)

- Assemblies—Components
- Bullion
- Carbon
- Catalysts
- Chemicals
- Chips
- Drillings
- Electronic Scrap
- High Temperature Resistant Alloys
- Paints
- Paste
- Powders
- Relays—Electrical
- Resins
- Ribbons
- Rings
- Salts
- Solutions
- Sweeps
- Telephone Switching Scrap
- Thick Film
- Wire

II. SCRAP CATEGORIES

A. Solution
  1. Acid
  2. Basic
  3. Matrix if known

B. Resin

C. Sludges

D. Burnable Material
  1. Carbon
  2. Filters
  3. Film
  4. Papers
  5. Unprepared Sweeps
  6. Others

E. Sweeps (Prepared)

F. Printed Circuit Boards
  1. Punch Outs
  2. Non Assembled
  3. Assembled
  4. Other . . . . .

G. Glass to metal Tubes, etc.
  1. Solid Precious Metal Parts
  2. Alloyed Metal Parts
  3. Plated Metal Parts
  4. Ceramics
  5. Thick Film
  6. Other . . . . .

H. Metal Scrap

I. Non Magnetic
  1. Impure Gold
  2. Impure Silver
  3. Copper Base
  4. Aluminum Base
  5. Brass Base
  6. Bronze Base
  7. Molybdenum Base
  8. Beryllium Base
  9. Lead Base
  10. Tin Base
  11. Other . . . . .

II. Magnetic
  1. Kovar Base
  2. Stainless Steel Base
  3. Iron Base
  4. Nickel Base
  5. Other . . . . .

I. Catalyst
  1. Carbon
  2. Alumina
  3. Rare Earth
  4. Silica
  5. Other . . . . .

(Continued on next page)

IDENTIFICATION CHECK LIST FOR PRECIOUS METALS

(Continued)

III. CONDITION

A. Alloy	F. Welded	K. Filled
B. Mixture	G. Hidden	L. Plated
C. Exposed	H. Inside	M. Casting
D. Fused	I. Surface	N. Other . . . . .
E. Soldered	J. Clad	

IV. VOLUME

Weight ..... lbs.

Volume ..... gallons

V. PRECIOUS METALS CONTENT

	Gold	Silver	Platinum	Palladium	Rhodium	Ruthenium	Iridium	Base/Matrix
Precious Metal Est. % Content								
Trace 0.5								
0.51 to 2.0								
2.01 to 10.0								
10.01 to 20.0								
20.01 to 30.0								
30.01 to 40.0								
40.01 to 50.0								
50.01 to 60.0								
60.01 to 70.0								
70.01 to 80.0								
80.01 to 90.0								
90.01 to 95.0								
95.01 to 100.0								

TRANSPORTATION GUIDE

A quick reference guide relating NARI's NF-80 commodity specifications with railroad carrier classification for nonferrous scrap metals and with export classifications in Schedule B.

R.R. CARRIER CLASSIFICATION	*SCHEDULE B (EXPORT)*
Copper Wire for Remelting Purposes Only	284.0210
Barley Birch Cobra	
Berry Clove	
Scrap Copper for Remelting Purposes Only	284.0210
Candy Cliff Dream	
Brass/Bronze Scrap for Remelting Purposes Only	284.0220
Drink Greet Malic	
Drove Honey Melon	
Ebony Ivory Naggy	
Enery Knife Niece	
Eider Label Night	
Eland Lace Noble	
Elbow Lady Nomad	
Elias Lake Ocean	
Engel Lamb Pales	
Erin Lark Pallu	
Fence Maize Palms	
Ferry Major Pants	
Grape Malar Parch	
Lead Scrap for Remelting Purposes Only	284.0600
Racks Rails	
Radio Ropes	
Battery Scrap for Remelting Purposes Only	284.0600
Rains	
Lead Scrap (In many cases where submarine batteries are shipped, there aren't any lead lugs but copper lugs instead and in such cases, material should be described as Copper Scrap)	284.0600
Rakes	
Tin Scrap for Remelting Purposes Only	284.0900
Ranks Ranch Raves	
Lead Scrap for Remelting Purposes Only	284.0210
Relay	
Lead Dross for Remelting Purposes Only	284.0150
Rents	
Lead/Tin Scrap for Remelting Purposes Only	284.0600
Roses	
Zinc Die Cast Scrap for Remelting Purposes Only	284.0700
Saves Scope	
Scabs Scoot	
Zinc Scrap for Remelting Purposes Only	284.0700
Score Scroll Seam	
Screen Scrub Shelf	
Scribe Seal	
Zinc Ingot (Not Classified as Scrap, takes Prime Rate)	686.1020
Scall	
Aluminum/Aluminum Alloy Scrap for Remelting Purposes Only	284.0400
Table Talent Tooth	
Taboo Talk Tough	
Tabor Talon Tread	
Taint Tarry Trump	
Take Tense Twist	
Talc Tepid	
Tale	

R.R. CARRIER CLASSIFICATION	*SCHEDULE B (EXPORT)*
Aluminum viz: Scrap, ground or chopped, not further processed than burned or incinerated, not remelted, in bags, crates, drums, *or in bulk.*	284.0400
Tall	
Aluminum Wire or Cable Scrap, for Remelting Purposes Only	284.0400
Taste	
Aluminum Scrap Borings and Turnings, for Remelting Purposes Only	284.0400
Teens Telic	
Aluminum Foil, Scrap, etc.	284.0400
Terse Testy	
Aluminum Scrap, Grindings, for Remelting Purposes Only	284.0400
Thigh	
Aluminum Smelting Residues, for Remelting Purposes Only	284.0100
Thirl	
Aluminum or Alloy Billets, Blooms, Ingots or Slabs (Not Classified as Scrap, takes Prime Rate)	684.0120
Throb	
Magnesium Metal or Alloy Scrap	284.0500
Wafer Wine World	
Walnut Wood Wrench	
Nickel Scrap for Remelting Purposes Only	284.0300
Aroma Burly Cache	
Cupro Nickel Scrap for Remelting Purposes Only	284.0220
Dandy Delta	
Daunt Decoy	
Nickel Copper Scrap for Remelting Purposes Only	284.0300
Hitch Indian Lemon	
Ideal Junto Lemur	
Iron and Steel Scrap for Remelting Purposes Only	282.0060
Pekoe Ultra Rusthirty	
Sabot Rusten	
Batteries, Electric, Spent, for Remelting Purposes Only	282.0060
Vaunt	

NOTES:

1. It should be noted that scrap which is not clearly recognizable as scrap and possess the same transportation characteristics as the original product, should be rated under the classification applicable to the original product.
2. Each bill of lading is to carry the following phrase: "This shipment is being transported for purposes of recycling as defined in applicable tariffs containing such provision."
3. The information we have furnished is to the best of our knowledge complete and properly representative of the items involved; however, in forwarding this information to you, we cannot assume any responsibility with respect to the correct classification, since this often is affected by the nature of the individual shipments under review. At best, therefore, this is merely indicative of the areas where we believe such items most likely would be listed.

GUIDELINES FOR WEIGHING, PACKING, SHIPPING AND RECEIVING

A. Detailed weights and commodity description advice should accompany all truck shipments and be mailed sufficiently in advance of all rail deliveries. This document should show order number and should list each item separately, indicating number of pieces in each item, and show separate gross, tare and net weights for each item shipped. If unable to include packing list with some shipments (e.g., some commercial trucks and piggybacks) then air mail on same day shipment leaves.

B. A packing list and diagram showing location of each item within a shipment should be attached to wall inside boxcars and trucks. Such a diagram can, of course, accompany vendor's trucks.

C. Trailers should be weighed (both gross and empty) dropped, if possible, and such scale tickets should accompany shipment, or be made part of the documents in paragraph A.

D. Open top trailers should be covered with a tarpaulin.

E. All trucks and boxcars should be sealed and seal numbers supplied with documents in paragraph A.

F. Boards should be placed across doors on both sides of railroad boxcars, to prevent material from leaking out, and so that doors may be easily opened.

G. Railroad cars should be uncoupled and at rest (if possible), before determining either gross or tare weight.

H. Careful attention by consumers should be given to all shipment advices, documents and packing lists.

I. Shipper should be notified immediately by telephone or wire whenever there is a weight discrepancy in excess of 1%.

J. When there is a discrepancy between shippers' and consumers' weights and/or classifications, all settlements should be accompanied—to whatever extent practical—by scale tickets, weight manifests, or other documents which describe how settlement weights were determined. Prompt notification should be made where consumer grading is different from detailed shipping documents.

K. Shipper should assure that any truck or boxcar being loaded is clean, in good shape, and free of holes which could jeopardize unloading operations or result in cargo spillage.

L. Different lots in any car or truck should always be properly segregated to avoid comingling and should also be tagged or marked adequately to assure appropriate identification and weighing of each lot at consumer's plant.

M. Packed material should always be in sound bales or containers (drums, boxes, etc.) and should be securely bulkheaded within conveyance to prevent breakage of packages during transit.

GUIDELINES FOR PROCEDURES IN CASES OF REJECTIONS

A. (1) It is incumbent on shipper to send to his consumer, with each shipment, appropriate documents (as outlined above) classifying material shipped; with different items properly identified, showing separate gross, tare, and net weights for each item shipped.

(2) It is incumbent on receiving plant, to the extent practical, to notify shipper by phone or telex promptly of any significant downgrading of material, and availability of inspection, prior to consumption.

(3) In those instances where material may or may not ultimately result in a downgrading, the receiving plant must also notify shipper of downgrading possibilities and accord shipper the option of leaving the material for consumers' handling, or having the material returned.

B. Shipper must respond promptly (within 24 hours, depending on plant) whether

(1) He accepts the downgrading, thereby releasing material for consumption;

(2) He elects to have the material returned with the understanding that said material must be replaced by material acceptable under the contract, unless mutually agreed otherwise. All unloading and reloading costs on returned material to be for account of the shipper.

C. Disposition of rejected material must be made within 10 days by the shipper, after which time it may be disposed of by the consumer.

(Guidelines developed by NARI's Dealer-Smelter Relations Committee to aid scrap processors when shipping material to nonferrous metal consumers.)

NARI CIRCULAR WS-80

Standards and Practices

for

Wool Stock

EFFECTIVE SEPTEMBER 30, 1979
(Supersedes WS-74)

National Association of Recycling Industries, Inc.
330 Madison Avenue, New York City, N. Y. 10017

1. QUANTITY — If the terms "more or less" or "about" or similar terms are used, it is understood that delivery may be for a variance of 10% on the specified commodity.

A. A contract for a carload unless otherwise agreed upon, shall mean the minimum quantity recognized by the official classification tariff of the district in which the seller is located.

B. A short ton shall be understood to be 2,000 lbs. A metric ton shall be understood to be 2204.6 lbs. A long ton shall be understood to be 2240 lbs.

2. PROMPT shipping instruction means shipment within fourteen days of order date unless otherwise agreed upon between buyer and seller. IMMEDIATE shipping instruction means shipment within five days of order date unless otherwise agreed upon between buyer and seller.

3. All deliveries shall be as represented by the seller. Any delivery containing in excess of the specific amount of rejections may, at the buyer's option, be rejected or with seller's approval assorted and the objectionable excess material may be taken to account at market price or returned.

4. New sweater cutters, seamers, jerseys, thread waste, and all other new woolen stock shall be sold on a net weight basis. All old woolen stock and new woolen clips shall be sold on a 5% maximum tare basis. The bales to be packed in tare consisting of wrappings which will not contaminate the contents.

5. All merchandise to be weighed over tested scales and detailed weight notes to be furnished with invoices.

6. MOISTURE in excess of the natural content is not allowable. If excess moisture content is found, it gives the buyer the right to rejection or price adjustment with the approval of the seller.

7. All contracts are subject to civil commotion, strikes, fires, floods and other acts of God, with the buyer having the option of cancelling the portion of the contract so delayed without penalty to the seller or he may elect to take the goods at contract price; if he so elects, shipment to be effected at a time mutually agreed between buyer and seller. In case of loss of all or any portion of the goods covered by a contract made under this agreement, the quantity lost shall not be replaced.

A. In the event of a general embargo of railroad transportation companies, because of which shipment cannot be made within the time specified on the order, the order shall remain in force provided the embargo does not continue for more than two weeks, and shipment is made within reasonable time after the embargo is lifted.

B. The seller shall immediately notify the buyer when he is unable to ship because of a general freight embargo and the buyer shall, within 48 hours after receiving such notification, week-ends and holidays excluded, advise the seller either by mail or telegraph, whether he elects to have the order remain in force or cancelled in case embargo remains in force longer than two weeks.

C. In the event an embargo is in force for a period of two weeks the buyer has the right within that period to designate another means of transportation. Should the change in transportation result in increased shipping cost, the difference in price shall be borne by the buyer.

8. Terms shall be as agreed between buyer and seller.

9. A contract should include the following:

A. MATERIAL: Material specified as subject to classification or specification adopted by the National Association of Recycling Industries, Inc.

B. QUANTITY: Should be definite.

C. PRICE: Should be stated in definite figures per specific unit of weight.

D. PLACE OF PURCHASE: Should be specifically stated if F.A.S. or delivered pier. Wharfage and unloading for the account of the seller.

E. SHIPMENT: Whenever possible, shipping instructions should be part of the contract.

F. DELIVERY: Should be stated.

G. TERMS: Must be inserted as agreed upon.

H. CONDITIONS: Any conditions affecting the contract shall be set forth in clear and definite terms.

I. RESPONSIBILITY AND ARBITRATION: It is recommended that the following two clauses regarding responsibility and arbitration be included as a part of all contracts.

CONTRACTS: RESPONSIBILITY

The retention of stock without written claim or objection for more than 30 days or after the picking, mixing or carding or other processing of the stock in any manner, whichever shall come first, shall constitute an unconditional acceptance of the same by the buyer; and thereafter no such stock shall be returned nor any claim or liability what-

soever relating to such a stock survive against the seller, except where excess tare or improper packing are found upon use of stock.

CONTROVERSIES: ARBITRATION

The parties hereto agree that if, within ten days after written notice thereof, they are unable through informal mediation or otherwise to settle any controversy or claim arising out of or relating to this contract or the breach thereof, then the same shall be settled by arbitration in accordance with the Rules of the American Arbitration Association and the judgment upon the award rendered by the arbitrator(s) may be entered in any court having jurisdiction thereof.

GRADE DEFINITIONS FOR OLD WOOL STOCK

1. GRADED WOOL STOCK

All deliveries must be as represented by the seller and may contain rejections not exceeding 5% based on net weight of accepted material, to be paid for at purchase price. Any delivery containing in excess of the specified amount of rejections may, at the buyer's option, be rejected and with seller's approval assorted and the objectionable excess material may be taken to account at the market price or returned. All the outthrows produced in resorting may either be returned for full credit to the seller or may be paid for at a price agreed upon by buyer and seller. Objectionable materials shall include all cotton, rayon, unskirted material and synthetics.

2. MIXED ROUGH WORSTEDS

To contain all grades and colors of men's worsted pants, suit jackets, and men's worsted topcoats. This stock may contain rejections not exceeding 5% based on net weight of accepted material, to be paid for at purchase price. Any delivery containing in excess of the specified amount of rejections may, at buyer's option, be rejected and with seller's approval assorted and the objectionable excess material may be taken to account at market price or returned.

3. ROUGH WOOL BODIES

To contain all colors and grades of ladies' wool coats. This stock may contain rejections not exceeding 5% based on net weight of accepted material, to be paid for at purchase price. Any delivery containing in excess of the specified amount of rejections may, at buyer's option, be rejected and with seller's approval assorted and the objectionable excess material may be taken to account at market price or returned.

4. MIXED ROUGH OVERCOATING

To consist of all colors and grades of men's wool overcoatings, pea jackets, mackinaws, snow suits and snow suit pants. This stock may contain rejections not exceeding 5% based on net weight of accepted material, to be paid for at purchase price. Any delivery containing in excess of the specified amount of rejections may, at the buyer's option, be rejected and with seller's approval assorted and the objectionable excess material may be taken to account at market price or returned.

5. MIXED ROUGH SUITINGS

To contain all colors of men's wool jackets, topcoats and pants, either tweeds or flannels. This stock may contain rejections not exceeding 5% based on net weight of accepted materials, to be paid for at purchase price. Any delivery containing in excess of the specified amount of rejections may, at the buyer's option, be rejected and with seller's approval assorted and the objectionable excess material may be taken to account at market price or returned.

6. MIXED WOOL KNITS

To contain all grades and colors of wool knitwear. This stock may contain rejections not exceeding 5% based on net weight of accepted material, to be paid for at purchase price. Any delivery containing in excess of the specified amount of rejections may, at the buyer's option be rejected and with the seller's approval assorted and the objectionable excess material may be taken to account at market price or returned.

7. SKIRTED MIXED WOOL MERINOES

To contain all grades and colors of wool garments that are free of linings. This stock may contain rejections not exceeding 5% based on net weight of accepted material, to be paid for at purchase price. Any delivery containing in excess of the specified amount of rejections may, at the buyer's option be rejected and with the seller's approval assorted and the objectionable excess material may be taken to account at market price or returned.

GRADE DEFINITIONS FOR NEW WOOL STOCK

8. MIXED WORSTED

To contain new woven cuttings, free of sewings, made from worsted yarns and free of synthetics.

9. MIXED TWEED

To contain new unfelted woven cuttings, free of sewings, made from coarse woolen yarns of two or more colors and free of synthetics.

10. MIXED SHETLAND

To contain new unfelted woven cuttings, free of sewings, made from woolen yarns and cuttings to be all in solid colors and free of synthetics.

11. MIXED FLANNEL

To contain new unfelted woven cuttings, free of sewings, made from fine woolen yarns and cuttings to be all in solid colors and free of synthetics.

12. MIXED OVERCOATING

To contain new woven cuttings, free of sewings, made from woolen yarns and free of synthetics.

13. MIXED GABARDINES

To contain new woven cuttings, free of sewings, made from worsted yarns and cuttings, solid in color and free of synthetics.

14. MIXED WORSTED SWEATER CUTTERS

To contain new knitted, unfelted cuttings, free of sewings, made from worsted yarns and free of synthetics.

15. MIXED WORSTED SEAMERS

To contain sewed cutoffs of sweater cuttings, free of synthetics.

16. MIXED WORSTED JERSEY

To contain new fine unfelted, knitted cuttings, free of sewings, made from single-ply worsted yarn and free of synthetics.

17. MIXED WOOLEN SWEATER CUTTERS

To contain new knitted, unfelted cuttings, free of sewings, made of woolen yarns and free of synthetics.

18. WORSTED THREAD WASTE

To contain all-wool spinning and/or weaving threads consisting of worsted-spun yarns and free of synthetics.

19. WOOLEN THREAD WASTE

To contain all-wool spinning and/or weaving threads consisting of wool-spun yarns and free of synthetics.

Official Copies of this Classification always carry the Association's Seal

(Printed on Recycled Paper)

MATERIALS RECOVERY GUIDELINES FOR SOURCE SEPARATION (40CFR Part 246)

Subpart B—Requirements and Recommended Procedures

§ 246.200 High-grade paper recovery.

§ 246.200–1 Requirements.

High-grade paper generated by office facilities of over 100 office workers shall be separated at the source of generation, separately collected, and sold for the purpose of recycling.

§ 246.200–2 Recommended procedures. *High-grade paper recovery from smaller offices.*

The recovery of high-grade paper generated by office facilities of less than 100 office workers should be investigated in conformance with the following recommended procedures and implemented where feasible.

§ 246.200–3 Recommended procedures: Market study.

An investigation of markets should be made by the organization responsible for the sale of recyclable materials in each Federal agency and should include at a minimum:

(a) Identifying potential purchasers of the recovered paper through standard market research techniques,

(b) Directly contracting buyers, and determining the buyers' quality specifications, the exact types of paper to be recycled, potential transportation agreements and any minimum quantity criteria; and

(c) Determining the price that the buyer will pay for the recovered paper and the willingess of the buyer to sign a contract for purchase of the paper at a guaranteed minimum price.

§ 246.200–4 Recommended procedures: Levels of separation.

A two-level separation is recommended for most facilities. This separation should consist of (a) high-grade wastepaper and (b) all other waste. Facilities that produce large enough quantities of waste computer paper and cards to make their separation into a separate category cost effective may choose to implement three levels of separation (1) computer papers, (2) other high-grade papers, (3) all other wastes.

§ 246.200–5 Recommended procedures: Methods of separation and collection.

(a) Systems designed to recover high grades of office paper at the source of generation, i.e., the desk, are the desk-top system, the two-wastebasket system, and the office centralized container system.

(b) With the desk-top system, recyclable paper is placed by the generator in a container on his desk, while other waste is placed in a wastebasket. With the two-wastebasket system, recyclable paper is placed by the generator in one desk-side wastebasket, and all other waste is placed in another. In the centralized container system, large containers for the collection of recyclables are placed in centralized locations within the office areas of the building. Nonrecyclable waste is placed in desk-side wastebaskets.

(c) The recommended system is the desk-top system because it is designed to maximize recovery of high value material in an economically feasible manner. While the two-wastebasket system and centralized container system have been implemented with success in isolated instances, data indicate that, on the whole, these systems have experienced high levels of contamination, low levels of participation and low revenues. The desk-top system has been designed to minimize these problems.

(d) The precise method of separation and collection used to implement the desk-top system will depend upon such things as the physical layout of the individual facility, the ease of collection, and the projected cost effectiveness of using various methods. The recommended desk-top system is carried out in the following manner:

(1) Workers are to deposit high-grade paper into a desk-top tray or other small desk-top holder to be supplied by the agency. This holder should be designed in such a way as to prevent it holding contaminants, such as food or beverage containers.

(2) At the office worker's convenience or when the tray is filled, the worker carries the paper to a conveniently located bulk container within the office area. This large container should be located in an area the worker frequents in the normal course of business.

(3) In locations where computer cards and printouts are to be collected separately, the receptacle for these wastes should be near the computer terminal or in some other logical, centrally located place.

(4) Collection of the high-grade paper from the bulk containers in the office area should be performed by the janitorial or general maintenance service. The number of locations and the frequency of collection of these containers will be determined by office size and maintenance staff capacity.

(e) Mixed paper and some high-grade office papers have also been recovered for recycling by hand-picking in an individual building's trash room or at a centralized facility serving several buildings. With these hand-picking systems, recyclable waste is not separated at the source of generation, but is mixed with other waste in the usual manner and removed to a centralized location where recyclable paper is picked out of the mixed waste by hand. Facilities may choose to use this method of high-grade paper recovery if it is shown by analysis to be economically preferable to source separation.

§ 246.200–6 Recommended procedures: Storage.

Among the alternatives for paper storage are on-site baling, the use of stationary compactors, or storage in corrugated boxes or normal waste containers. Stored paper should be protected from fire, inclement weather, theft, and vandalism.

§ 246.200–7 Recommended procedures: Transportation.

Transportation to market may be supplied by the facility, by a private hauler, or by the purchaser. Collection of the recyclable paper should be on a regular established schedule.

§ 246.200–8 Recommended procedures: Cost analysis.

After potential markets have been located (but prior to initiation of formal bidding procedures), preliminary determinations of various separation methods, storage, and transportation costs have been made, and estimated tonnages of both recoverable high-grade paper and residual solid waste have been established an analysis should be conducted which compares the costs of the present waste collection and disposal system with the proposed segregated systems. At a minimum, the study should include all capital, operating and overhead costs and take into account credits for revenue from paper sales and savings from diverting recycled materials from disposal. Potential costs to upgrade collection and disposal practices to comply with EPA's Guidelines for the Storage and Collection of Residential, Commercial and Institutional Solid Wastes (40 CFR Part 243) and Thermal Processing and Land Disposal Guidelines (40 CFR Parts 240 and 241) should be included in the analysis. In formulating a separation system and evaluating its costs, every effort should be made to use janitorial and waste collection resources efficiently. This cost analysis should enable the facility to determine the most cost effective method of implementing the requirement of this part.

§ 246.200–9 Recommended procedures: Contracts.

Formal bids should be requested for purchase of the recovered materials, such bids being solicited in conformance with bidding procedures established for the responsible agency. Contracts should include the buyer's quality specifications, quantity, and transportation agreements, a guarantee that the material will be accepted for one year or more, and a guaranteed minimum purchase price.

§ 246.200–10 *Recommended procedures.* Public information and education.

A well-organized and well-executed public information and education program explaining the justification, goals, methods and level of separation should be conducted to inform and motivate office personnel and secure their cooperation in separating their waste. This public information and education program should precede the program and continue on a regular basis for its duration.

§ 246.201 Residential materials recovery.

§ 246.201–1 Requirement.

Separation of used newspapers at the source of residential generation in conjunction with separate collection shall be carried out at all facilities in which more than 500 families reside, and the newspapers shall be sold for the purpose of recycling.

§ 246.201–2 Recommended procedures: Newsprint recovery from smaller residential facilities.

The recovery of newsprint generated by residential facilities of less than 500 families should be investigated in conformance with the following recommended procedures and implemented where feasible.

§ 246.201–3 Recommended procedures. Glass can and mixed paper separation.

In areas where markets are available it is recommended that glass, cans and mixed paper be separated at the source of generation and separately collected for the purpose of recycling.

§ 246.201–4 Recommended procedures. Market study.

An investigation of markets should be made for each material by the organization responsible for sale of recyclable materials in each agency and should include at a minimum

(a) Identifying potential purchasers of the recovered material through standard market research techniques

(b) Directly contacting buyers and determining the buyers quality specifications, potential transportation agreements and any minimum quantity criteria

(c) Determining the prices that the buyer will pay for the recovered material and the willingness of the buyer to sign a contract for the purchase of the material at guaranteed minimum prices

§ 246.201–5 Recommended procedures: Methods of separation and collection.

Following separation within the home, any of the following methods of collection may be used

(a) Materials may be placed at the curbside by the resident and may be collected from each household using separate trucks or compartmentalized vehicles

(b) For multi-family dwellings, separated materials may be placed in bulk containers located outside of the building and collected by trucks dispatched to collect recyclables

(c) Collection stations may be set up at convenient locations to which residents bring recyclables These stations should provide separate bulk containers for each item to be recycled The size and type of container will depend on the volume and type of material collected the method of transportation to be used in hauling the materials to market and the frequency of removal

§ 246.201–6 Recommended procedures: Transportation to market.

Transportation to market may be supplied by the facility or the community generating the waste by a private hauler, or by the purchaser

§ 246.201–7 Recommended procedures: Cost analysis.

After potential markets have been located (but prior to initiation of formal bidding procedures), preliminary determinations of various separation methods storage and transportation costs have been made and estimated tonnages of both recoverable materials and residual solid waste have been established, an analysis should be conducted which compares the costs of the present waste collection and disposal system with the proposed segregated systems At a minimum this study should include all capital, operating and overhead costs and take into account credits for revenue from paper sales and savings from diverting recycled materials from disposal Potential costs to upgrade collection and disposal practices to comply with EPA's Guidelines for the Storage and Collection of Residential, Commercial and Institutional Solid Wastes (40 CFR Part 243) and Thermal Processing and Land Disposal Guidelines (40 CFR Parts 240 and 241) should be included in the analysis. In formulating a separate collection system and evaluating its costs, every effort should be made to use idle equipment and underutilized collection manpower to reduce separate collection costs. This cost analysis should enable the facility to determine the most cost effective method if implementing the requirements of this part

§ 246.201–8 Recommended procedures: Contracts.

Formal bids should be requested for purchase of the recovered materials, such bids being solicited in conformance with bidding procedures established for the responsible jurisdiction Contracts rial will be accepted for one year or more should include the buyer's quality specifications, quantity and transportation agreements, a guarantee that the mate- and a guaranteed minimum purchase price

§ 246.201–9 Recommended procedures: Public information and education.

A well organized and well executed public information and education program explaining the justification, goals methods and level of separation should be conducted to inform and motivate householders and to secure their cooperation in separating their waste This public information and education program should precede the program and continue on a regular basis for its duration

§ 246.202 *Corrugated container recovery.*

§ 246.202–1 Requirement.

Any commercial establishment generating 10 or more tons of waste corrugated containers per month shall separately collect and sell this material for the purpose of recycling

§ 246.202–2 Recommended procedures: Corrugated container recovery from smaller commercial facilities.

The recovery of corrugated containers from commercial facilities generating less than 10 tons per month should be investigated in conformance with the following recommended procedures and implemented where feasible

§ 246.202–3 *Recommended procedures:* Market study.

An investigation of markets should be made by the organization responsible for sale of recyclable material in each Federal agency and should include at a minimum

(a) Identifying potential purchasers of the recovered corrugated through standard market research techniques

(b) *Directly contacting buyers and determining the buyers' quality specifications* potential transportation agreements and any minimum quantity criteria.

(c) Determining the price that the buyer will pay for the recovered corrugated and the willingness of the buyer to sign a contract for purchase of the paper at a guaranteed minimum price

§ 246.202–4 Recommended procedures: Methods of separation and storage.

The method selected will depend upon such variables as the physical layout of the individual generating facility, the rate at which the corrugated accumulates, the storage capacity of the facility and the projected cost-effectiveness of using the various methods All of the following suggested modes of separation and storage presuppose that the corrugated boxes will be accumulated at a central location in the facility after their contents are removed and that the boxes are flattened

(a) Balers of various sizes corrugated boxes are placed in balers and compacted into bales These bales may be stored *inside or outside of the facility* The bales should be protected from fire, inclement weather, theft, and vandalism.

(b) Stationary compactors or bulk containers corrugated boxes are placed in a stationary compactor or bulk containers outside of the facility The containers should be protected from fire inclement weather theft and vandalism

§ 246.202–5 Recommended procedures: Transportation.

Transportation to market may be supplied by either the facility a private hauler or the purchaser In facilities to which goods are delivered from a central warehouse corrugated may be backhauled by delivery trucks to the central facility and baled there for delivery to a user

§ 246.202–6 Recommended procedures: Cost analysis.

After potential markets have been identified (but prior to initiation of formal bidding) preliminary determinations of various separation methods, storage and transportation costs have been made, and estimated tonnages of both recoverable material and residual solid waste have been established an analysis should be conducted which compares the costs of the present waste collection and disposal system with the proposed segregated systems At a minimum the study should include all capital, operating and overhead costs and take into account credits for revenue from paper sales and savings from diverting recycled materials from disposal Potential costs to upgrade collection and disposal practices to comply with EPA's Guidelines for the Storage and Collection of Residential, Commercial and Institutional Solid Wastes (40 CFR Part 243) and Thermal Processing and Land Disposal Guidelines (40 CFR Parts 240 and 241) should be included in the analysis This cost analysis should enable the facility to determine the most cost effective method of implementing these guidelines.

§ 246.202–7 Recommended procedures: Establishment of purchase contract.

Formal bids should be requested for purchase of the recovered materials, such bids being solicited in conformance with bidding procedures established for the responsible agency Contracts should include the buyer's quality specifications, transportation agreements, a guarantee that the material will be accepted for one year or more and a guaranteed minimum purchase price

§ 246.203 Reevaluation.

§ 246.203–1 Requirement.

Agencies in which facilities make the determination not to comply with these guidelines must conduct the required analysis and report in accordance with § 246.100 (e) or (f), as appropriate, yearly.

NATIONAL ASSOCIATION OF RECYCLING INDUSTRIES, INC.
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NARI PROPOSALS FOR RECYCLING TARGETS

METALS

In contrast to the minimal expansion rates envisaged by DOE, NARI proposed the following percentage increases for growth in the share of the market for recycled metals by 1987:

Copper	--	25% increase
Aluminum	--	60% "
Zinc	--	40% "
Lead	--	25% "
Iron and Steel	--	50% "

Based on NARI's calculations of the current share of the market levels for scrap metals, the Association's proposals would envisage the following:

	Current Levels	NARI-Proposed Levels for '87
Copper	46%	57%
Aluminum	26%	42%
Zinc	12%	17%
Lead	51%	65%
Iron and Steel	22%	33%

PAPER

Based on DOE's own calculations of current share of market levels for paper stock grades, NARI proposed the following:

	Current Levels	NARI-Proposed Levels for '87
Newsprint	14%	26%
Tissue	28%	43%
Printing and Writing Paper	7%	10%
Packaging Paper	4%	10%
Unbleached Kraft Paperboard	4%	25%
Semichemical Paperboard	26%	35%
Solid Bleached Paperboard	0%	10%
Recycled Paperboard	100%	To be calculated based on increased production level
Construction Paper and Board	33%	60%

TEXTILES

NARI proposed the following targets for textiles, based on current share of market levels:

	Current Levels	NARI-Proposed Levels for '87
Broad Woven Fabric Mills, Wool	13%	16%
Yarn Mills, Wool	13%	16%
Felt Goods, Except Hats	59%	85%
Padding and Upholstery	93%	95%
Non-Woven Fabrics	17%	20%
Cordage and Twine	22%	25%
All Others	0%	3%

RUBBER

NARI accepted the DOE-proposed targets for rubber, based on current share of market levels:

	Current Levels	Proposed Levels for '87
Tires and Inner Tubes	2%	5%
Industrial Products	3%	5%
Rubber Footwear	0%	15%
Tire Retreading and Repair Shops	9%	12%

Designation: E 702 - 79

AMERICAN SOCIETY FOR TESTING AND MATERIALS
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Standard Specification for MUNICIPAL FERROUS SCRAP[1]

This standard is issued under the fixed designation E 702; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval.

1. Scope

1.1 This specification covers the chemical and physical requirements of municipal ferrous scrap that is intended for use by such industries listed as follows:

1.1.1 Copper industry (precipitation process),

1.1.2 Iron and steel foundries,

1.1.3 Iron and steel production,

1.1.4 Detinning industry, and

1.1.5 Ferroalloy industry.

1.2 Questions concerning material rejection, downgrading, and retesting based on failure to meet the requirements of this specification shall be dealt with through contractual arrangements between the purchaser and the supplier.

2. Applicable Document

2.1 *ASTM Standard*:

E 701 Testing Municipal Ferrous Scrap[2]

3. Definitions

3.1 *municipal ferrous scrap*—ferrous waste that is collected from industrial, commercial, or household sources and destined for disposal facilities. Typically, municipal ferrous scrap consists of a metal or alloy fraction, a combustible fraction, and an inorganic noncombustible fraction that includes metal oxides.

3.2 *total combustibles*—materials that include paints, lacquers, coatings, plastics, etc., associated with the original ferrous product, as well as combustible materials (paper, plastic, textiles, etc.) which become associated with the ferrous product after it is manufactured.

3.3 *metallic yield*—the weight percent of the municipal ferrous scrap that is generally recoverable as metal or alloy.

4. Chemical Requirements

4.1 Municipal ferrous scrap shall conform to the requirements as to chemical composition for the respective end uses prescribed in Table 1.

4.2 The chemical requirements listed in Table 1 are based on melt analyses except where noted.

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[1] This specification is under the jurisdiction of ASTM Committee E-38 on Resource Recovery and is the direct responsibility of Subcommittee E38.02 on Ferrous Metals.

Current edition approved Nov. 5, 1979. Published January 1980.

[2] *Annual Book of ASTM Standards*, Part 46

5. Physical Requirements

5.1 Municipal ferrous scrap shall conform to the physical properties for the respective end uses prescribed in Table 2.

6. Test Methods

6.1 Determine the physical and chemical requirements of municipal ferrous scrap in accordance with Methods E 701.

TABLE 1 Chemical Requirements

Element	Composition, %				
	Copper Industry (Precipitation Process)	Iron and Steel Foundries	Iron and Steel Production[A]	Detinning Industry[B]	Ferroalloy Production
Phosphorus, max	...	0.03	0.03	...	0.03
Sulfur, max	...	0.04	0.04	...	...
Nickel, max	...	0.12	0.08	...	..
Chromium, max	...	0.15	0.10	...	0.15
Molybdenum, max	...	0.04	0.025	...	..
Copper, max	...	0.20	0.10	.	0.20
Aluminum, max	...	0.50	0.50	4.00[E]	0.15
Tin	...	0.30 max[D]	0.30 max	0.15 min[F]	0.30
Lead, max	...	0.03	0.15	...	..
Zinc, max	...	0.06	0.06	...	...
Iron (metallic), min	96.0	...	...	...	...
Silicon, max	...	...	0.10	...	..
Manganese, max	...	...	...	...	0.35
Carbon, max	...	...	...	...	0.6
Titanium, max	...	...	...	...	0.025
Total combustibles, max	0.2[C]	4.0	4.0	...	0.5[G]
Metallic yield, min	...	90.0	90.0	..	90.0

[A] Experience has shown that material which has been incinerated probably will not meet these requirements.

[B] A minimum of 95 weight % of the material delivered shall be magnetic. Nonmagnetic material attached to the original magnetic article may be included in the minimum requirement.

[C] The scrap shall be appropriately processed (for example, by burning, chemical detinning, etc.) to be virtually free of combustibles.

[D] For steel castings, the requirement for tin content is 0.10 max %.

[E] Not based on melt analyses due to aluminum losses during melting; to be determined by a method mutually agreed upon between the purchaser and supplier.

[F] Refer to sections on magnetic fraction and chemical analysis of tin in Methods E 701. Normal separation of white goods and heavy iron yields tin contents equal to or greater than 0.15 weight %. Lesser tin contents would impact severely the value of the scrap to detinners.

[G] The scrap shall be appropriately processed (for example, by burning, chemical detinning, etc.) to be virtually free of combustibles.

TABLE 2 Physical Requirements

End-Use	Property	
	Bulk Density, max, lb/ft³ (kg/m³)	Form
Copper Industry (Precipitation Process)	30 (480)	loose, shredded as agreed upon between purchaser and supplier; shall not be baled or baled[A]
Iron and Steel Foundries	50 (800)	loose, baled, or baled[B] as agreed upon between purchaser and supplier
Iron and Steel Production	75 (1200)	loose[C] or baled[B] as agreed upon between purchaser and supplier
Detinning Industry	25 (400)	shredded, 95 weight % shall be −6, +½ in. (−152, +12.5 mm); shall not be baled, baled, burned, incinerated, or pyrolyzed
Ferroalloy Production	50 (800)	loose, as agreed upon between purchaser and supplier

[A] Various consumers may establish gage limitations on the material they purchase.

[B] Industry practice is to specify a maximum bale size that may vary among users.

[C] Experience has shown that if the size range is 95 weight %, −2, +¼ in. (−50, +6.3 mm), the bulk density requirement can be met and the material will be loose and free flowing.

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Source
Can Manufacturers Institute

State Restrictive Packaging Law Summary--9/1/80

	EFFECTIVE DATE	PROVISIONS	DEFINITION OF BEVERAGE
ALASKA	October 1, 1981	--bans sale of beverage containers with detachable pull-tabs --bans sale of beverage containers connected by plastic or "nondegradable" devices	". . . beer or other malt beverages or carbonated soft drinks, in liquid form."
CALIFORNIA	January 1, 1979	--bans sale of beverage containers with detachable pull-tabs	". . . beer, or other malt beverages and mineral waters, soda water and similar carbonated soft drinks in liquid form and intended for human consumption."
CONNECTICUT	January 1, 1980	--minimum 5¢ deposit --minimum 1¢ handling fee --bans sale of beverage containers with detachable pull-tabs --provides for re-employment assistance as well as a re-training and re-location allowance to employees adversely affected by institution of the law --job displacement allowance--75% of employee's weekly salary, including unemployment insurance, not to exceed 85% of total salary --provides for the establishment of private redemption centers --permits retailers to refuse to accept containers if a redemption center is located within 1 mile of their place of business --containers must be labeled on the top either "CT" or "Connecticut, "Return for Refund" or "Return for Deposit, " and the deposit amount, in at least 1/4 inch type.	". . . beer, malt beverages, mineral and soda waters and similar carbonated soft drinks."

DELAWARE	One year after passage of similar legislation by the States of Maryland and Pennsylvania	--minimum 5¢ deposit --minimum 20% handling fee --ban on sale of beverage containers with detachable pull-tabs --ban on non-biodegradable connecting devices --provides for the establishment of redemption centers --prohibits persons under 20 years of age from returning containers in State liquor stores --specifies that all containers must be either embossed or imprinted with the word "Delaware" and the refund value of the container in type not smaller that 1/4 inch in size	". . . mineral waters, but not including any naturally sparkling waters, soda waters or any other carbonated beverage not containing alcohol that is commonly known as a 'soft drink,' and any beer, ale or other malt beverage containing alcohol."
HAWAII	July 1, 1979*	--bans sale of beverage containers with detachable pull-tabs --exempts containers "the only detachable part of which is a piece of pressure sensitive tape" --enforced by the Department of Health	". . . beer, malt beverages, mineral waters, fruit juices, ades and other similar non-carbonated drinks, soda water and flavored carbonated drinks."
IOWA	August 1, 1979**	--minimum 5¢ deposit --minimum 1¢ handling fee --ban on sale of beverage containers with detachable pull-tabs --provides for the establishment of redemption centers --requires an annual transmittal of the first $100,000 of unredeemed liquor deposits to the State Substance Abuse Fund --containers must be labeled "Iowa Refund 5¢" in type at least 3 millimeters (9 point) in size	". . . alcoholic liquor, beer, mineral water, soda water or similar carbonated soft drinks."
MAINE	January 1, 1978	--minimum 5¢ deposit --minimum 2¢ handling fee --ban on sale of beverage containers with detachable pull-tabs --ban on sale of beverage containers connected by "plastic rings or material which does not decompose by photo-degradation, chemical degradation or biodegradation within a reasonable period of time upon exposure to the elements."	". . . beer, ale or other drink produced be fermenting malt, soda water or other nonalcoholic carbonated drink in liquid form."

*originally January 1, 1979
**deposit on liquor containers became effective May 1, 1979

MAINE (Cont'd)		--provides for the establishment of redemption centers --determines penalties for littering and requires that litter receptacles be placed in all public establishments --requires that the "refund value" be clearly embossed, imprinted or otherwise permanently affixed to the top of each beverage container	
MASSACHUSETTS	June 1, 1979	--ban on sale of beverage containers with detachable pull-tabs	". . . malt beverage or carbonated soft drink."
MICHIGAN	December 3, 1978	--minimum 5¢ deposit on "certified" containers, 10¢ on all others --bans sale of beverage containers with detachable pull-tabs --labeling requirements--refund value must be clearly embossed, stamped or otherwise affixed to the container --provides container certification standards --requires that dealers selling beverages for off-premise consumption provide a convenient means by which containers can be returned, and the deposit refunded. --provides for the establishment of regional redemption centers	". . . soft drinks, soda water, carbonated natural or mineral water, or other non-alcoholic carbonated drink; beer, ale or other malt drink of whatever alcoholic content
MINNESOTA	January 1, 1977	--ban on sale of beverage containers with detachable pull-tabs	". . . carbonated soft drink, beer, other malt beverage, or tea."
OHIO	July 1, 1982	--ban on sale of beverage containers with detachable pull-tabs	". . . beer, malt beverage, or mixed beverage as defined in Section 4301.01 of the Revised Code, or any soft drink as defined in Section 913.22 of the Revised Code." The term 'mixed beverage' is specified to include beverages containing alcohol. 'Soft drink' is defined as ". . . any nonalcoholic flavored carbonated beverage, soda, soda water, or fruitade, any nonalcoholic flavored still beverage, artificial waters whether or not carbonated, and bottled table waters, seltzer, or club soda."

OREGON	October 1, 1972	--2¢ minimum deposit on "certified" beverage containers, as defined in the Act, 5¢ on all others --ban on sale of beverage containers with detachable pull-tabs --exempts from the pull-tab ban the use of "pressure sensitive tape" --bans connecting devices for beverage containers which will not decompose within 120 days of disposal, either by chemical degradation, biodegradation or photodegradation --specifies that the refund value must be clearly indicated on the container --provides for the establishment of redemption centers, subject to the approval of the Oregon Liquor Control Commission	For application to deposit provisions: ". . . beer or other malt beverages and mineral waters, soda water and For application to pull tab provisions: ". . . any beverage in liquid form intended for human consumption."
SOUTH CAROLINA	July 1, 1980	--ban on sale of beverages with detachable pull-tabs	". . . carbonated soft drink or malt beverage."
VERMONT	July 1, 1975	--minimum 5¢ deposit --ban on sale of beverage containers with detachable pull-tabs and plastic or non-biodegradable connecting devices; provides exemption for pressure sensitive tape. --minimum 20% handling fee --provides for the establishment of redemption centers --includes provision for a public education program relating to the law --requires that the word "Vermont" and the refund value must be indicated on the container by either printing or embossing	For application to the pull-tab ban provision: ". . . all drinks sold in liquid form intended for human consumption." For application to the deposit provisions: ". . . beer or other malt beverages and mineral waters, soda water and carbonated soft drinks."
VIRGINIA	January 1, 1979	--ban on sale of beverage containers with detachable pull-tabs	". . . beer as defined in Sec. 4-2, paragraph 3. of the Code of Virginia or other malt beverages and mineral waters, soda water and formulated soft drinks, with or without carbonation."

Can Manufacturers Institute
September, 1980

State	Litter Abatement/Recycling Laws	Forced Mandatory Deposits On Beverage Containers	Clean Community Systems And Others
ALABAMA	No Activity.	No Activity.	5 CCS Cities. 1 CCS County.
ALASKA	1979 - S.B. 1 introduced - failed to pass. Carried over to 1980 and passed by the Legislature. 1980 - Governor signed Litter Reduction Resource Recovery Act.	1978 - Mandatory deposit referendum defeated.	
ARIZONA	1979 - Senate Natural Resources Committee sponsored a litter control program resolution to be adopted. No movement. 1980 - Litter/Recycling Bill introduced. No movement.	1979 - Mandatory deposit legislation introduced and defeated in Committee. 1980 - Mandatory deposit legislation defeated in Committee.	Beverage Industry Recycling Program (BIRP).
ARKANSAS	No Activity.	1979 - Mandatory deposit legislation introduced. Died in Committee.	1980 - Governor's Advisory Council — Litter Control. 2 CCS Cities.
CALIFORNIA	1977 - Solid Waste Management Act passed. 1978 - Solid Waste Management Act implemented.	1975-1980 - Mandatory deposit legislation introduced consecutively for 5 years. 1980 Sacremento County Board of Supervisors considered mandatory deposit legislation. Board did not pass the initiative but put it on the ballot. July, 1980 - Board of Supervisors removed the initiative from the ballot.	15 CCS Cities.
COLORADO	1977 - Litter/Recycling Law introduced, passed and enacted. 1979 - State repealed funding of litter law.	1976 - Mandatory deposit referendum voted down 33%-67%.	6 CCS Cities

State	Litter Abatement/Recycling Laws	Forced Mandatory Deposits On Beverage Containers	Clean Community Systems And Others
CONNECTICUT	1978 - Litter/Recycling Law passed. 1980 - Litter/Recycling Law implemented.	1978 - Mandatory deposit bill passed. 1980 - Mandatory deposit law implemented.	
DELAWARE	No Activity.	1978 - Passed mandatory deposit law with contiguous states language in effective date. 1979 - Bill introduced to remove contiguous language. Carried over to 1980. 1980 - H.B. 688 failed to remove the contiguous states language.	
FLORIDA	No Activity.	1979 - Mandatory deposit bill defeated in Subcommittee.	4 CCS Cities.
GEORGIA	1979 - Litter abatement law introduced. Failed to pass prior to adjournment.	No Activity.	1978 - Statewide CCS.
HAWAII	1977 - Environmental Quality Litter Control Law passed. 1979 - Environmental Quality Litter Control Law implemented.	1978 - Deposit legislation introduced. Died in committee.	
IDAHO	No Activity.	No Activity.	3 CCS Cities.
ILLINOIS	1979 - Litter bill introduced. No action. 1980 - Litter bills carried over either tabled, defeated.	1979 - deposit bill introduced. No action.	1 CCS City.
INDIANA	1979 - Litter bill introduced but not acted upon.	1979 - Deposit legislation died with adjournment.	6 CCS Cities.
IOWA	No Activity.	1978 - Deposit bill passed and signed by Governor. 1980 - Law specified that the handling fee be retained at 1¢ per container. The original 1978 law specified that after 2 years of law, handling fee be reduced to 1/2¢ per container.	6 CCS Cities.

State	Litter Abatement/Recycling Laws	Forced Mandatory Deposits On Beverage Containers	Clean Community Systems And Others
KANSAS	No Activity.	1979 - Deposit bill introduced and defeated.	3 CCS Cities.
KENTUCKY	1978 - Resource Conservation Recovery and Beautification Act enacted. Assessment was only on wholesalers and manufacturers (excluded retailers) of 16 identified product categores. 1980 - Supreme Court found that assessment to be discriminatory and ordered funds collected to be returned.	No Activity.	6 CCS Cities.
LOUISIANA	1979 - Litter bill passed Committee but no action on the floor prior to adjournment. 1980 - Four Litter Bills introduced. One passed House but failed to pass Senate before adjournment.	1979 - Deposit bill reported unfavorable. 1980 - Deposit bill killed in Committee.	1 CCS City.
MAINE	No Activity.	1976 - Mandatory deposit referenda passed. January, 1978 - Mandatory deposit law became effective. 1979-1980 - Amendment enacted increasing handling fee to 20% minimum. 1979 - Referenda to repeal mandatory deposit law turned down.	
MARYLAND	1979 - Litter Bill defeated. 1980 - Litter Bill defeated.	1975 - Montgomery County Council has a deposit ordinance on the books but the Council has not implemented it. 1978 - Howard County mandatory deposit referendum defeated 36%-64%. 1980 - Deposit bill defeated on House floor.	Beverage Industry Recycling Program (BIRP).

State	Litter Abatement/Recycling Laws	Forced Mandatory Deposits On Beverage Containers	Clean Community Systems And Others
MASSACHUSETTS	1978 - Litter Bill - No action. 1979 - Litter Bills introduced. Hearings held. No action taken. 1980 - Litter Bill died with adjournment. 1980 - Establishment of Corporation for a Cleaner Commonwealth by Governor. Funding for 1 year.	1976 - Mandatory deposit referenda defeated - 49%-51%. 1977 - Deposit bill introduced - failed to pass. 1978 - Deposit bill introduced - failed to pass. 1979 - Deposit bill passed House & Senate. Governor vetoed.	2 CCS Cities.
MICHIGAN	No Activity.	1976 - Mandatory deposit referenda passed. 1979 - Mandatory deposit law implemented.	2 CCS Cities.
MINNESOTA	1978 - Litter Law carried over to 1979. No movement.	1978 - Deposit bill carried over to 1979. No movement. 1980 - Deposit bill introduced. No action reported on bill prior to adjournment.	1 CCS City.
MISSISSIPPI	No Activity.	1980 - Deposit bill died in Committee.	3 CCS Cities.
MISSOURI	1979 - Litter Bill introduced. No action taken.	1979 - Deposit bill introduced. No action taken.	2 CCS Cities.
MONTANA	No Activity.	1979 - Deposit bill defeated in House. 1980 - Initiative #87.	
NEBRASKA	1979 - Litter Bill introduced, passed and enacted. 1980 - Introduction of repeal of Litter Law failed to get out of Committee.	1978 - Mandatory deposit referenda defeated 43%-57%.	Statewide CCS.
NEVADA	No Activity.	No Activity.	1 CCS City.
NEW HAMPSHIRE	1979 - Litter Bill defeated in Committee.	1979 - Deposit bill defeated in Committee by vote.	

	Litter Abatement/Recycling Laws	Forced Mandatory Deposits On Beverage Containers	Clean Community Systems And Others
	1979 - Litter Abatement measure introduced but failed to pass prior to adjournment.	1979 - Deposit bills introduced. No action. 1980 - Deposit bills introduced. Hearings held - no action.	4 CCS Cities.
	No Activity.	No Activity.	3 CCS Cities.
	No Activity.	1979 - Deposit bill introduced. Killed in Committee. 1980 - Deposit bill introduced. Defeated in Committee. Others still pending.	2 CCS Cities.
[illegible] CAROLINA	1979 - Litter Abatement Bill was not acted upon. 1979 - Two bills introduced. Waste product recycling fund implemented with State funds. No action.	1979 - Deposit bill died in Committee upon adjournment.	6 CCS Cities. 6 CCS Counties.
[illegible] DAKOTA	1979 - Litter Abatement - no action reported prior to adjournment.	No Activity.	1 CCS City.
OHIO	1979 - Litter Abatement/Recycling Law was introduced. Carried over to 1980. 1980 - Passed Legislature and was signed by the Governor.	1979 - Mandatory deposit initiative to Legislature. Legislature had 4 months to act upon it and failed to do so. Proponents gathered additional signatures needed to place Deposit Bill on November ballot. November, 1979 - Deposit bill defeated in all 88 counties - 28%-72%.	5 CCS Cities.
OKLAHOMA	No Activity.	1979 - Development of Study group to analyze deposit legislation in other states.	3 CCS Cities.
OREGON	No Activity.	1972 - Mandatory Deposit Law implemented. 1979 - Amendments to Oregon Mandatory Deposit Law to add handling fee and increase the deposit introduced. Was not enacted.	

State	Litter Abatement/Recycling Laws	Forced Mandatory Deposits On Beverage Containers	Clean Community Systems And Others
PENNSYLVANIA	1980 - Litter/Recycling Bill introduced. No action.	1979 - Deposit bill introduced. No action. Carried over.	
PUERTO RICO	No Activity.	No Activity.	
RHODE ISLAND	1979 - Litter Bill. No definitive action taken.	1979 - Deposit bills introduced. Rhode Island "Bottle Bill" Commission voted 8-5 against recommendation of mandatory deposit legislation. House H.W voted 10-5 against passage of two deposit bills based upon recommendation of the Commission. 1980 - Deposit bill died with adjournment of the Legislature. Deposit bill called for a referendum. Passed out of Committee; passed House; Senate Chairman defeated.	
SOUTH CAROLINA	1978 - Litter Control Act passed. May 5, 1978 - Litter Control Act implemented.	No Activity.	6 CCS Cities.
SOUTH DAKOTA	No Activity.	No Activity.	2 CCS Cities.
TENNESSEE	1979 - Litter/Recycling bill heard in Committee but failed to pass. 1980 - Litter Bills voted out of Committee but no action taken by full House. 1980 - Governor committed a comprehensive statewide litter control program. Details to be announced in October, 1980.	1980 - Deposit laws introduced. Killed by Committee vote.	4 CCS Cities.
TEXAS	No Activity.	1979 - Mandatory deposit bill died with adjournment.	19 CCS Cities.
UTAH	No Activity.	No Activity.	

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State	Litter Abatement/Recycling Laws	Forced Mandatory Deposits On Beverage Containers	Clean Community System And Others
VERMONT	No Activity.	1975 - Mandatory deposit law became effective. 1980 - Amendment to original law - handling fee being raised to 2¢ per container.	
VIRGINIA	1975 - Virginia Litter Control Act passed. July, 1976 - Litter Control Act implemented.	1976 - Fairfax County Deposit Ordinance passed by Board of Supervisors. August 28, 1980 - Virginia Supreme Court ruled that the Fairfax County Board of Supervisors did not have the authority to enact the ordinance requiring a 5¢ deposit on carbonated beverage containers. August 28, 1980 - Virginia Supreme Court also found that Loudoun County's Board of Supervisors acted beyond its authority in placing a deposit on beer containers sold within the County. Loudoun's deposit on soft drink containers was not an issue in the case, and was therefore not addressed.	11 CCS Cities. 10 CCS Counties.
WASHINGTON	1971 - Model Litter Control & Recycling Act introduced, passed and signed. 1972 - Model Litter Control & Recycling implemented.	1970 - Mandatory deposit referendum defeated. 1979 - Mandatory deposit Initiative qualified and sent to Senate. Senate vote 10-3 against passage of bill. Killed in Rules Committee. 1979 - Statewide mandatory deposit initiative defeated 42%-58%.	1 CCS City.
WEST VIRGINIA	No Activity.	1979 - Deposit bill introduced. No action. 1980 - Deposit bill introduced. No action.	2 CCS Cities.
WISCONSIN	1980 - Litter bill introduced. Hearing held. Voted to take no action at this time.	1978 - Stevens Point referendum defeated. 1979 - Deposit bills introduced and carried over to 1980. 1980 - Committee on Environmental Resources reviewing other deposit law states.	
WYOMING	No Activity.	1979 - Deposit bill killed with adjournment.	1 CCS City.

State Litter Abatement Law Summary -- 9/1/80

	ASSESSMENT SCHEDULE	PRODUCTS ASSESSED	PROVISIONS
ALASKA TITLE: "An Act relating to the reduction of litter and the recovery of materials and energy from litter; and providing for an effective date." EFFECTIVE DATE: July 1, 1980 ENFORCEMENT AGENCY: Department of Environmental Conservation	Not applicable	Not applicable	--$500,000 initial appropriation from the State General Fund --provides for annual Legislative appropriations thereafter --requires that the Department of Environmental Conservation prepare annual reports on the effectiveness of the law --provides for the encouragement of public anti-litter efforts --establishes an annual youth litter patrol --requires distribution of uniform litter receptacles and bags --specifies standards for distribution of grants --creates a seven-member advisory council, appointed by the Governor, to work with the Department of Environmental Conservation on implementation of the law --bans the sale of beverage containers with detachable pull-tabs and those connected by non-biodegradable devices
CALIFORNIA TITLE: "The Solid Waste Management Act of 1980" EFFECTIVE DATE: January 1, 1978 ENFORCEMENT AGENCY: Solid Waste Management Board	Not applicable--funds provided through a percentage of the incorporation tax paid by all corporations in the State.	Not applicable	--clean-up of recreational land and public roads --grants to eligible public and private entities to carry out litter clean-up programs --specifies standards for grantees --provides for the establishment of recycling centers and expansion of existing centers through coordination with the Solid Waste Management Board. --research and administrative support of the following programs: • litter collection • distribution of uniform litter receptacles and bags • enforcement of litter laws • resource and energy recovery from waste

COLORADO TITLE: "Colorado Litter Control Act" EFFECTIVE DATE: July 1, 1977 ENFORCEMENT AGENCY: Division of Local Government	Not applicable	Not applicable	--development of public educational programs relating to litter in the State --litter clean-up programs organized through public involvement as well as divisions of local government --distribution of uniform litter receptacles and bags --development of programs aimed at recycling of litter --provides for coordination between industry and government in anti-litter and recycling goals --terminates July 1, 1982 unless re-enacted
CONNECTICUT TITLE: "An Act Concerning Litter Control and Recycling" EFFECTIVE DATE: January 1, 1980 ENFORCEMENT AGENCY: Department of Environmental Protection	RETAILERS: $25-$300 per place of business, determined by annual sales, for those handling the identified products MANUFACTURERS, DISTRIBUTORS AND WHOLESALERS: $25-$3,000 for all places of business, determined by the number of employees within the State ranging from 1-19 to 1,000 or more $75-$9,000 for all places of business, determined by the number of employees within the State ranging from 1-19 to 1,000 or more, for those handling the identified products	RETAILERS: --grocery stores and supermarkets --take-out and fast food restaurants --retail liquor establishments --restaurants, taverns, cafes, hotels and motels --service station and auto-related businesses --drug and sundry stores --all other retailers and service firms MANUFACTURERS, DISTRIBUTORS AND WHOLESALERS: --glass --metal --plastic or fiber containers --liquor --newspapers and magazines --household paper and paper products --auto and truck tires --auto parts --beer and soft drinks --all others	--clean-up of State-owned recreational lands and public roads --clean-up and maintenance of property owned or leased by political subdivisions --grants to public agencies and private entities for the expansion of existing recycling centers and the establishment of new projects --establishment of youth litter corps for clean-up projects --purchase and distribution of litter bags and receptacles --implementation of an educational program aimed at increasing public awareness of litter and recycling programs --application of behavioral science techniques in litter control --supplemental enforcement of litter laws, including the hiring of additional personnel --money remaining in Litter Control and Recycling Fund not designated for expenditure prior to July 1, 1988 shall be transferred to the General Fund --bans the sale of beverage containers with detachable pull-tabs

HAWAII TITLE: "An Act Relating to Environmental Quality and Litter Control" EFFECTIVE DATE: January 1, 1979 ENFORCEMENT AGENCY: Department of Health	Not applicable	Not applicable	--allocation of $300,000 from the General Fund to implement the Act --empowers the Director of the Department of Health to: • coordinate state and local agencies to aid in litter control efforts • implement study of available research on litter control, prevention, removal, disposal and recycling, and to ultimately institute those programs • conduct public education programs on the litter problem within the State • seek other funds or resources--either private or public--to aid in implementing requirements of the Act --bans the sale of beverage containers with detachable pull-tabs
NEBRASKA TITLE: "The Nebraska Litter Reduction & Recycling Act" EFFECTIVE DATE: October 1, 1979 ENFORCEMENT AGENCY: Department of Environmental Control	MANUFACTURERS & WHOLESALERS: $150 per $1,000,000 of gross proceeds on sale of specified products	--food for human consumption --pet food --groceries --cigarettes and other tobacco products --soft drinks and carbonated waters --beer and other malt beverages --household paper and paper products, excluding magazines, periodicals, newspapers, and literary works --glass containers --metal containers --plastic or fiber containers made of synthetic materials --cleaning agents and toiletries	--establishes public education, motivation and participation programs aimed at creating an anti-litter ethic in the state --improves enforcement of litter laws --establishes litter clean-up projects --develops new or improved community source separation and recycling programs --provides for survey of litter amount and composition on highways and urban areas within six months of effective date and follow-up studies--to be reported to the Governor --annual progress reports prepared on the law's effectiveness --establishment of youth litter patrols --establishes standards for uniform litter receptacles --sunset date of October 1, 1984
OHIO TITLE: "Ohio Litter Control & Recycling Program"	--an assessment on all corporations in the State, based on their corporate franchise tax rate, not to exceed $5,000 annually.	--intoxicating liquor, beer, malt beverages, wine, mixed beverages or spirituous liquor --glass, metal, plastic or fiber containers with capacity of less than 2 gallons	--establishment and maintenance of education programs to increase public awareness of litter problem and of importance of resource and energy conservation --coordination of activities within political subdivisions aimed at developing regional programs of litter control, resource recovery and conversion of litter and solid waste into energy

OHIO (Cont'd)	--all manufacturers and sellers of "litter stream products" are assessed an amount in addition to that noted above, also based on their corporate franchise tax rate, not to exceed $5,000 annually. Therefore, the maximum total tax liability for manufacturers and sellers of "litter stream products" is $10,000 annually.	--container crowns and closures --circulars and handbills used for distribution to the public --flexible packaging used to wrap consumer goods --retread rubber and retread tires	--provides assistance to political subdivisions in establishment of recycling centers --provides for grants to localities for programs specified in the law --bans the sale of beverage containers with detachable pull-tabs
SOUTH CAROLINA TITLE: "Litter Control Act of 1978" EFFECTIVE DATE: May 5, 1978 ENFORCEMENT AGENCY: Department of Health and Environmental Control	Not applicable	Not applicable	--establishes Litter Control Account to provide funds through contributions and an initial $500,000 appropriation from the General Fund --allows for annual appropriation by the General Assembly --provides for the coordination of local anti-litter efforts --establishes a statewide education program in elementary and secondary schools to create awareness of litter problems within the State --provides for the hiring of temporary employees specifically students, for participation in summer clean-up programs --requires a study on methods of implementation of litter reduction projects within the State --seeks cooperation of industry in anti-litter efforts of the Department of Health and Environmental Control --provides for a cost/benefit analysis of recycling litter --bans the sale of beverage containers with detachable pull-tabs

VIRGINIA TITLE: "Virginia Litter Control Act" EFFECTIVE DATE: July 1, 1976 ENFORCEMENT AGENCY: Department of Conservation and Economic Development	MANUFACTURERS, WHOLESALERS, DISTRIBUTORS & RETAILERS: $5 per establishment handling specified products OTHER: Excise tax on beer --1.2¢ per case (24/12) Excise tax on carbonated soft drinks-- $50-$6,000 determined by annual gross receipts, ranging from $100,000 or less to $10,000,001 or more	--food for human or pet consumption --groceries --cigarettes and tobacco products --soft drinks and carbonated waters --beer and other malt beverages --wine --newspapers and magazines --paper products and household papers --glass containers --metal containers --plastic or fiber containers made of synthetic materials --cleaning agents and toiletries --non-drug drugstore sundry items --distilled spirits --motor vehicle parts	--organization of local anti-litter campaigns --investigation of the availability of funds from private sources to be used in programs outlined in the law --allocation of funds to study available research on development of litter control methods --investigation of the methods and success of other techniques in control of litter, and possible development of those programs within the State --requires the distribution of uniform litter receptacles and bags
WASHINGTON TITLE: "Model Litter Control and Recycling Act" EFFECTIVE DATE: September 1, 1972 ENFORCEMENT AGENCY: Department of Ecology	MANUFACTURERS, WHOLESALERS & RETAILERS: $150 per $1,000,000 of gross proceeds of items specified	--food for human consumption --groceries --cigarettes and tobacco products --soft drinks, carbonated waters, beer and other malt beverages --newspapers and magazines --household paper and paper products --glass and metal containers --plastic or fiber containers made of synthetic materials --cleaning agents, toiletries and non-drug drugstore sundry products	--coordination of organizations involved in litter control --organization of voluntary litter clean-up programs --anti-litter education program --particular emphasis on grants to individuals to aid in development of recycling programs

APPENDIX G

federal register

TUESDAY, SEPTEMBER 21, 1976

PART II:

ENVIRONMENTAL PROTECTION AGENCY

■

SOLID WASTE MANAGEMENT

Guidelines For Beverage Containers

Title 40—Protection of Environment

CHAPTER I—ENVIRONMENTAL PROTECTION AGENCY

[FRL 606-6]

PART 244—SOLID WASTE MANAGEMENT GUIDELINES FOR BEVERAGE CONTAINERS

Section 209 of the Solid Waste Disposal Act of 1965 (Pub. L. 89-272), as amended by the Resource Recovery Act of 1970 (Pub. L. 91-512), requires the Administrator of the U.S. Environmental Protection Agency (EPA) to "recommend to appropriate agencies and publish in the FEDERAL REGISTER guidelines for solid waste recovery, collection, separation, and disposal systems. * * *" Further, Section 211 mandates that Federal agencies "shall insure compliance with the guidelines recommended under Section 209 and the purpose of this (Solid Waste Disposal) Act."

In fulfillment of its responsibilities under Section 209, EPA promulgated the first set of guidelines: "Guidelines for the Thermal Processing and Land Disposal of Solid Wastes," on August 14, 1974 (40 CFR 240 and 241). Since that time, guidelines have been promulgated for the Storage and Collection of Residential, Commercial, and Institutional Solid Waste on February 13, 1976 (40 CFR 243); for Source Separation for Material Recovery on April 23, 1976 (40 CFR 5); and for Resource Recovery Facilities in September of 1976 (40 CFR 245). In addition, non-mandatory guidelines for "Procurement of Products that Contain Recycled Material" were published in the FEDERAL REGISTER on January 15, 1976 (40 CFR 247).

These "Beverage Container Guidelines" were first published in proposed form in the FEDERAL REGISTER on November 13, 1975. At that time public comment was solicited and a period of 60 days was provided during which interested parties could make their views known to the Environmental Protection Agency.

The proposed guidelines required that Federal facilities establish a system for the return of beer and soft drink beverage containers in order to achieve the environmental benefits of reduced solid waste and litter and the conservation of energy and material resources. They required that all beverage containers be rendered returnable through the application of a 5 cent deposit as an incentive to the consumer to return empty containers. This refundable deposit was to be paid by the consumer, upon purchase of beverages, and refunded by the dealer when the empty container was returned.

The implicit goal of the proposed guidelines was to gain the desired environmental benefits through reuse or recycling of returned containers. It has become evident, through public and Congressional comments, that this point was not always clearly understood. Therefore, the guidelines now being published attempt to clarify that any type of container is acceptable for use in implementing a returnable beverage container system as long as beverage containers are returned and are either reused or recycled, where markets for recyclable materials are available. Changes have also been made to increase the flexibility available to agencies and facilities in implementing such a system to ease the adaptation of the guidelines' requirements to particular, local situations.

The Agency received 5955 responses during the comment period from private citizens, industry representatives, labor unions, environmental groups, and other government agencies. Copies of all responses received on or before January 12, 1976, are available for public inspection at the EPA Public Information Reference Unit (EPA Library), 401 M Street, S.W., Washington, D.C. during normal working hours. In order to facilitate review, the 5955 comments were carefully screened to identify the issues raised in each comment. Similar issues were then organized into groups which were then carefully summarized. These 33 summary issues reflect, but do not repeat verbatim, the views of every respondent who commented on the Proposed Beverage Container Guidelines on or before January 12, 1976. Two other documents are also on file with the EPA Public Information Reference Unit for public review. The first lists each respondent and indicates which respondents commented on each issue. The second explains each issue and presents the EPA responses to all issues raised. Duplicates of those two documents are also available for inspection at the Public Information Reference Unit of the 10 EPA Regional Offices.

The following discussion treats the more important of the 33 issues during the public comment period.

Several of those who commented on the guidelines were concerned with the issue of energy. Many based their objections on the erroneous assumption that these guidelines require the exclusive use of refillable bottles. They suggested that energy consumption under the guidelines would actually increase due to the increased bulk and weight of refillable containers, and resultant increases in transportation requirements. Extensive analyses have shown that refillable bottles, when reused several times, are less energy-intensive than either one-way glass bottles or cans when all factors are considered. Thus the introduction or increased use of refillable bottles on Federal facilities would provide benefits in terms of energy conservation. However, the fact is that the guidelines do not require the use of any particular container type, either implicitly or explicitly. Nonrefillable bottles and cans that are returned and recycled also conserve energy. Therefore, regardless of the types of containers used in implementing the guidelines, energy conservation should result.

Other commenters were concerned that the guidelines would have severe adverse effects on employment in the container manufacturing industry. The origin of these concerns is the prediction, in various estimates of the impact of national beverage container legislation, that a major shift in container mix from cans and nonrefillable bottles to refillable bottles would result from such legislation. Those estimates predict that a shift of national scope away from nonrefillable containers would cause the employment dislocations that these commenters fear. However, those impact predictions do not apply here, because the guidelines apply only to Federal facilities. These Federal facilities comprise only two to four percent of the national beverage market widely dispersed across the country. The remaining 96 to 98 percent of the national market would remain unchanged. Thus, even the maximum possible shift to refillable bottles at Federal facilities would have no more impact on the national container mix and, therefore, on employment in the container manufacturing industry, than a slight shift in consumer preference.

Many commenters indicated concern that the guidelines would have severe negative economic impact on some or all segments of the beer, soft drink, and container manufacturing industries and those industries that supply materials to them, as well as on the retail and distribution systems. Those who predict cost increases refer to some studies that have been performed in an attempt to predict the impact of national beverage container legislation. Their basic assumptions are not applicable to the guidelines because virtually all of these studies assume a substantial national shift from nonrefillable containers to refillables that would lead to extensive capital expenditures for new equipment. Again, because these guidelines apply only to the two to four percent of national beverage sales that take place on Federal facilities, it is neither appropriate nor accurate to extrapolate downward from national impact analyses. It is unlikely that any of the capital or other major costs predicted to result from national beverage container legislation would follow implementation of these guidelines, even if the container mix on Federal facilities shifted entirely to refillable bottles. Further, even if unexpected new costs are incurred by beverage producers, bottlers, distributors, or wholesalers, the provisions for nonimplementation described in § 244.100(d) can be applied if the costs preclude the effective achievement of the goals of the guidelines.

Most of those who cite adverse economic impacts anticipate that the ultimate result will be higher prices to consumers. Several others, though, assuring increased availability of beverages in refillable containers, anticipate reduced cost to consumers because refillables are the least expensive container type.

Because no new capital costs are expected to be incurred under the guidelines, no general price increases are expected either. Further, because beverages are less expensive in refillable containers, average beverage prices should be reduced by their increased use.

Some commenters expressed the belief that these guidelines would eliminate freedom of choice in products and pa

aging offered to Federal government and military personnel. This is not the case. The guidelines neither restrict nor require the use of any specific container type. In fact, others suggested that the guidelines would actually increase the choices available to consumers by increasing the likelihood that refillables will be added to the present container mix because they presently provide the least expensive means for achieving the environmental goals sought.

Some of those who commented indicated concern that, while the proposed guidelines provided for non-implementation due to economic impracticability, the term "economic impracticability" was not defined. This led some to fear that non-implementation could never be justified, while others feared that claims of economic impracticability might be used indiscriminately to justify non-implementation, even where implementation was actually possible. In response to these valid concerns, the guidelines have been modified to clarify the concept of economic impracticability. The final guidelines also explain particular circumstances in which practical considerations would rule out implementation, i.e. situations in which implementation is economically feasible, but would not operate effectively to achieve the goals of the guidelines.

Several commenters were confused by, or indicated concern about the provisions for vending machines in the proposed guidelines. Much of the confusion and concern was justified as those provisions were not clear. The proposed guidelines tried to consider the variety of physical and economic situations in which vending machines are used and prescribe specific requirements for that usage. As revised, the guidelines requirements have been written to allow decisions on vending machine implementation to be made on the basis of particular situations within a facility. Therefore, while the revised guidelines do not treat vending machine beverage sales explicitly, the provisions are sufficiently broad that they cover vending machines implicitly. Decisions for vending machine implementation should be based on the same considerations that are applied to other beverage sales.

Some commenters objected to the assertion in the proposed guidelines that the economic and inflationary impacts of the guidelines would be minor and the Agency's consequent decision that it was not required to prepare an Inflationary Impact Statement. These commenters point to a wide variety of studies and predictions, citing them as proof that increased costs or prices would result from implementation of the guidelines and that these increases would be inflationary. Virtually all of these predictions are highly dependent on the assumption that there would be a substantial national shift to refillable bottles. This is not expected to occur as a result of these guidelines.

The economic and inflationary impacts of the guidelines have been carefully evaluated. It has been determined that the effects will be minor and that the guidelines are not a "major action" requiring an inflation impact statement as prescribed by Executive Order 11821 and OMB Circular A-107.

Several commenters stated that EPA should withhold action on these guidelines until the subject of returnable beverage containers has been debated by the Congress. This is apparently a view that is not shared by the U.S. Senate. A returnable beverage container amendment proposed by Senator Hatfield to S. 2150, the Solid Waste Utilization Act of 1976, was rejected by the Senate after debate that was limited to 30 minutes. After the vote on this amendment, the following statements were made on the floor of the Senate (Congressional Record, June 30, 1976, p. S11058–S11086):

Mr. Stafford. I think it would be a mistake to view the defeat of the Hatfield amendment as a mandate to the Administrator of the Environmental Protection Agency to halt efforts to initiate innovative programs requiring returnable containers on Federal installations and facilities. Rather, today's vote may more properly be interpreted as a decision by the Senate that it does not want to authorize a nationwide container deposit law at this time.

Just as the bill permits individual States to chart their own courses of action, the Senate this morning has reinforced that principle by rejecting a single Federal standard.

However, the bill permits individual States to enact their own container policies and legislation. In that manner, innovative programs can be tested and demonstrated for study by the entire Nation.

Similarly, the proposal for a returnable container policy at Federal facilities can provide our Nation with valuable information.

Nothing that has happened on the floor of the Senate can properly be interpreted as a mandate from this body to halt that valuable demonstration effort.

Mr. Muskie. Mr. President, rejection of the Hatfield amendment should in no way prejudice EPA's ongoing programs to develop solid waste management programs which may include resource conservation—source reduction programs.

EPA currently has regulations which require deposits on beverage containers sold at Federal facilities. These regulations are new. We are still learning from them. They will continue in effect even without the Hatfield amendment so we can have a real test of the impact and implication of the kind of proposal without the amendment.

Neither of these statements was rebutted.

Following the defeat of his returnable beverage container amendment, Mr. Hatfield introduced an amendment calling for the President, through the cooperation of appropriate Federal agencies to study all aspects of national beverage container deposit legislation. This substitute amendment was passed by a vote of 85–1, with 14 not voting. While these guidelines affect a much smaller and widely dispersed market than would national legislation, information gained through their implementation could clearly be an integral part of such a study. S. 2150 was passed by a vote of 88–3 with 9 not voting.

Future Revisions. Section 209 of the Act states that guidelines "shall be revised from time to time." Following the public comment period, several changes were made to clarify and refine the proposed guidelines. No more changes are planned for the immediate future. Implementation of the guidelines may result in the identification of areas that require refinement or modification. To that end, comments or suggestions are invited from persons with experience in implementing these guidelines or other returnable beverage container systems.

Promulgation. These guidelines are issued under the Authority of Section 209 (a) of the Solid Waste Disposal Act of 1965 (Pub. L. 89-272) as amended by the Resource Recovery Act of 1970 (Pub. L. 91-512). Chapter I of Title 40 of the Code of Federal Regulations is amended effective October 20, 1976 by adding a new Part 244.

Dated: September 10, 1976.

RUSSELL E. TRAIN,
Administrator.

Subpart A—General Provisions

Subpart A—General Provisions

§ 244.100 Scope.

(a) The "Requirement" sections contained herein delineate minimum actions for Federal agencies for reducing beverage container waste.

(b) Section 211 of the Act and Executive Order 11752 make the "Requirements" section of the guidelines mandatory upon Federal agencies. They are recommended for adoption by State and local governments and private agencies.

(c) *Intent and Objectives.*—(1) These Guidelines for Beverage Containers are intended to achieve a reduction in beverage container solid waste and litter, resulting in savings in waste collection and disposal costs to the Federal Government. They are also intended to achieve the conservation and more efficient use of energy and material resources through the development of effective beverage distribution and container collection systems.

(2) The guidelines are intended to achieve these goals by making all beverage containers returnable and encouraging reuse of recycling of the returned containers. To accomplish the return of beverage containers, a deposit of at least five cents on each returnable beverage container is to be paid upon purchase by the consumer and refunded to the consumer when the empty container is returned to the dealer. This refund value provides a positive incentive for consumers to return the empty containers. Once containers are returned, nonrefillable containers can be recycled and refillable bottles can be reused.

(3) The minimum deposit of five cents as been chosen because it is deemed a large enough incentive to induce the return of most containers, and it is the most widely used deposit amount in present deposit systems. Because this action is intended to be compatible with present deposit systems, it is recommended that Federal facilities apply higher deposit levels in localities where higher levels are ordinarily used and lower deposit levels if the local area has an established return system with a minimum deposit level, for some or all beverage containers, of less than five cents.

(4) Final determination of how the requirements of the guidelines will be met rests with the head of each Federal agency.

(5) Federal facilities implementing the guidelines must charge refundable deposits on both refillable beverage containers and nonrefillable ones. Use of a refillable beverage container system will achieve the objectives of this guideline and will also most likely result in lower beverage prices for consumers. However, placing refundable deposits on nonrefillable containers, which are subsequently returned and recycled, also achieves the objectives of the guidelines.

(d) *Nonimplementation for Federal Facilities.*—(1) The objectives of these guidelines are to reduce solid waste and litter and to conserve energy and materials through the use of a return system for beverage containers. In order to have a substantial impact on solid waste and litter created by beverage containers and to effect the concomitant energy and materials savings in a cost-effective manner, three conditions will be necessary: first, that consumers continue to purchase beverages from dealers at Federal facilities; second, that empty containers be returned and then reused or recycled; third, that the costs of implementation are not prohibitive. The head of each agency should consider these factors in order to make a determination regarding implementation of these guidelines.

(2) The Administrator recognizes that the requirements of these guidelines may not be practical at some Federal facilities due to geographic or logistic problems of a local nature. Further, he recognizes that the use of a returnable beverage container system will accomplish nothing if all reasonable efforts to implement such a system have failed to induce consumers to buy beverages in returnable containers or to return them when empty. When these situations persist, agencies may determine not to continue implementation of these guidelines.

(3) Federal agencies that make the determination not to use returnable containers shall provide to the Administrator the analysis and rationale used in making that determination as required by Section 244.100(f)(3). The Administrator will publish notice of availability of this report in the FEDERAL REGISTER. The following conditions are considered to be valid reasons for not using returnable beverage containers.

(i) Situations in which, after a trial implementation, there is no alternative available that results in meeting the objectives of the guidelines in a cost effective manner. Examples of indications of this situation include, but are not limited to: (1) data indicating a substantial and persistent reduction in beverage sales that is not directly attributable to any other cause; and (2) failure to establish a beverage container return rate that effectively achieves the objectives of these guidelines.

(ii) Situations in which no viable alternative can be found which avoids excessive, irrecoverable costs to the facility or the Agency. These conditions may prevail at either part or all of a facility. It is expected that facilities will use returnable beverage containers in those portions of their beverage distribution systems where it is effective to do so. However, it is recognized that in some situations, such as for unattended vending machines where it is impractical to establish refund locations, or in small remote outlets where the majority of consu[illegible]e transient, it may not be possible to use returnable containers effectively. The provisions for nonimplementation can be applied to those portions of a facility.

(e) The Environmental Protection Agency will render technical assistance and other guidance to Federal agencies when requested to do so pursuant to Section 3(d)(1) of Executive Order 11752.

(f) *Reports.* — (1) *Implementation Schedule Report.* This report is to advise the EPA of plans for the implementation of these guidelines. It is to be submitted to the Administrator within 60 days following an agency's determination to implement, and should include a list of planned implementation actions and a schedule indicating when those actions will be taken.

(2) *Annual Status Report.*—This report will provide information to the Administrator which will enable him to monitor compliance with the guidelines as required by Executive Order 11752. The form of this report will be prescribed by the Administrator at a later time.

(3) *Nonimplementation Report.*—Nonimplementation reports are to be submitted to the Administrator as soon as possible after a final agency determination has been made not to use returnable beverage containers but not later than sixty days after this determination. The Administrator will indicate to the reporting agency his concurrence or nonconcurrence with the agency's decision, including his reasons therefor. This concurrence or nonconcurrence is advisory.

Nonimplementation reports should include:

(i) A description of alternative actions considered or implemented, including those actions which, if taken or continued, would have involved a deposit or return system.

(ii) A description of ongoing actions that will be continued and actions taken or proposed that would preclude future implementation of a returnable beverage container system. This statement should identify all agency facilities or categories of facilities that will be affected.

(iii) An analysis in support of the determination not to implement a deposit system, including technical data, market studies, and policy considerations used in making that determination. If the determination not to implement is based on inability to achieve a cost-effective system, this analysis should include such things as sales volume, impact on total overhead costs, administrative costs, other costs of implementation, percentage of containers sold that are returned, solid waste and litter reduction, energy and materials saved, and retail prices (before and after implementation).

§ 244.101 *Definitions.*

(a) "Beverage" means carbonated natural or mineral waters; soda water and similar carbonated soft drinks; and beer or other carbonated malt drinks in liquid form and intended for human consumption.

(b) "Beverage container" means an airtight container containing a beverage under pressure of carbonation. Cups and other open receptacles are specifically excluded from this definition.

(c) "Consumer" means any person who purchases a beverage in a beverage container for final use or consumption.

(d) "Dealer" means any person who engages in the sale of beverages in beverage containers to a consumer.

(e) "Deposit" means the sum paid to the dealer by the consumer when beverages are purchased in returnable beverage containers, and which is refunded when the beverage container is returned.

(f) "Distributor" means any person who engages in the sale of beverages, in beverage containers, to a dealer, including any manufacturer who engages in such sale.

(g) "Federal Agency" means any department, agency, establishment, or instrumentality of the executive branch of the United States government.

(h) "Federal facility" means any building, installation, structure, land, or public work owned by or leased to the Federal Government. Ships at sea, aircraft in the air, land forces on maneuvers, and other mobile facilities; and United States Government installations located on foreign soil or on land outside the jurisdiction of the United States Government are not considered "Federal facilities" for the purpose of these guidelines.

(i) "On-Premise Sales" means sales transactions in which beverages are purchased by a consumer for immediate consumption within the area under control of the dealer.

(j) "Recycling" means the process by which recovered materials are transformed into new products.

(k) "Refillable Beverage Container" means a beverage container that when returned to a distributor or bottler is refilled with a beverage and reused.

(l) "Refund" means the sum, equal to the deposit, that is given to the consumer or the dealer or both in exchange for empty returnable beverage containers.

(m) "Returnable Beverage Container" means a beverage container for which a deposit is paid upon purchase and for which a refund of equal value is payable upon return.

Subpart B—Requirements

§ 244.200 Requirements.

§ 244.201 Use of Returnable Beverage Containers.

(a) All beverages in beverage containers sold or offered for sale shall be sold in returnable beverage containers. On-premise sales are specifically excluded from this requirement provided that empty beverage containers are returned to the distributor for refilling, or are recycled, either by the dealer or by the distributor when markets for recyclable materials are available.

(b) The deposit shall be at least five (5) cents unless the local area has an established return system in operation with a lower minimum deposit level. In those specific areas, Federal facilities may adopt a minimum deposit equal to the local deposit level.

(c) A dealer shall accept from a consumer any empty beverage containers of the kind, size and brand sold by the dealer, and pay the consumer the refund value of the beverage container, provided the container is refillable or is labelled in accordance with Section 244.202(a).

(d) The refund shall be provided at the place of sale whenever possible or as close to that place as practicable, and in any event, on the premises of the particular federal facility involved. Refund locations shall be conspicuously labelled as refund centers. If they are not in the immediate vicinity of the place of sale, notice of their location shall be prominently posted at that place of sale.

(e) A dealer shall not procure beverages in beverage containers from distributors who refuse to: accept from the dealer any returnable beverage containers of the kind, size and brand sold by the distributor; pay to the dealer the refund value of the beverage containers; and reuse the returned containers or recycle them where markets for recyclable materials are available.

(f) Returned refillable beverage containers shall be returned to the distributor for refilling. Nonrefillable beverage containers shall be returned to the appropriate distributor or recycled, where markets for recyclable materials are available.

§ 244.202 Information.

(a) With the exception of refillable beverage containers, every returnable beverage container sold or offered for sale by a dealer shall clearly and conspicuously indicate, by embossing or by stamp, or by a label securely affixed to the beverage container, the refund value of the container and that the container is returnable.

(b) Dealers shall inform consumers that beverages are sold in returnable beverage containers by placing a sign, or a shelf label, or both, in close proximity to any sales display of beverages in returnable containers. That sign or label shall indicate that all containers are returnable, separately list the beverage price and deposit to be paid by the consumer, and shall indicate where the empty beverage containers may be returned for refund of the deposit.

§ 244.203 Implementation Decisions and Reporting.

Federal agencies are to determine whether or not to implement these guidelines by (date, one year after promulgation in the FEDERAL REGISTER). Reporting of that determination shall be in accordance with the following requirements:

(a) Federal agencies that plan not to implement these guidelines shall report that decision to the Administrator in accordance with the procedures described in § 244.100(f)(1).

(b) Implementing agencies shall provide to the Administrator an annual status report in accordance with the procedures described in § 244.100(f)(2).

(c) Agencies that determine not to implement these guidelines shall provide to the Administrator a nonimplementation report in accordance with § 244.100(f)(3). This report shall include the reasons for nonimplementation, based on concepts presented in § 244.100(d), and shall be repeated at least every three years.

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[FR Doc.76-27390 Filed 9-20-76;8:45 am]

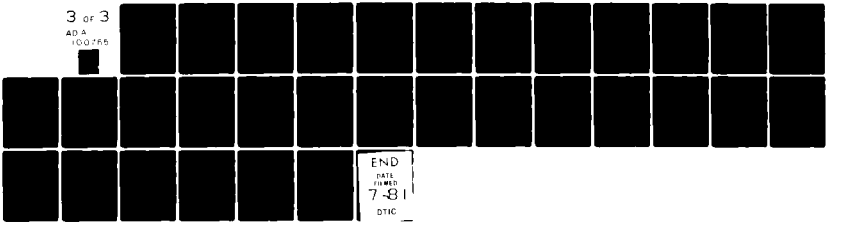
Source:
Can Manufacturers Institute

APPENDIX H

State Restrictive Packaging Law Summary--9/1/80

	EFFECTIVE DATE	PROVISIONS	DEFINITION OF BEVERAGE
ALASKA	October 1, 1981	--bans sale of beverage containers with detachable pull-tabs --bans sale of beverage containers connected by plastic or "nondegradable" devices	". . . beer or other malt beverages or carbonated soft drinks, in liquid form."
CALIFORNIA	January 1, 1979	--bans sale of beverage containers with detachable pull-tabs	". . . beer, or other malt beverages and mineral waters, sodo water and similar carbonated soft drinks in liquid form and intended for human consumption."
CONNECTICUT	January 1, 1980	--minimum 5¢ deposit --minimum 1¢ handling fee --bans sale of beverage containers with detachable pull-tabs --provides for re-employment assistance as well as a re-training and re-location allowance to employees adversely affected by institution of the law --job displacement allowance--75% of employee's weekly salary, including unemployment insurance, not to exceed 85% of total salary --provides for the establishment of private redemption centers --permits retailers to refuse to accept containers if a redemption center is located within 1 mile of their place of business --containers must be labeled on the top either "CT" or "Connecticut, "Return for Refund" or "Return for Deposit, " and the deposit amount, in at least 1/4 inch type.	". . . beer, malt beverages, mineral and soda waters and similar carbonated soft drinks."

AD-A100 765 GORDIAN ASSOCIATES INC WASHINGTON DC F/G 13/2
TRENDS IN NAVY WASTE REDUCTION AND MATERIALS MARKETS.(U)
JUN 81 N68305-80-C-0064
UNCLASSIFIED CEL-CR-81.014 NL



DELAWARE	One year after passage of similar legislation by the States of Maryland and Pennsylvania	--minimum 5¢ deposit --minimum 20% handling fee --ban on sale of beverage containers with detachable pull-tabs --ban on non-biodegradable connecting devices --provides for the establishment of redemption centers --prohibits persons under 20 years of age from returning containers in State liquor stores --specifies that all containers must be either embossed or imprinted with the word "Delaware" and the refund value of the container in type not smaller that 1/4 inch in size	". . . mineral waters, but not including any naturally sparkling waters, soda waters or any other carbonated beverage not containing alcohol that is commonly known as a 'soft drink,' and any beer, ale or other malt beverage containing alcohol."
*HAWAII	July 1, 1979*	--bans sale of beverage containers with detachable pull-tabs --exempts containers "the only detachable part of which is a piece of pressure sensitive tape" --enforced by the Department of Health	". . . beer, malt beverages, mineral waters, fruit juices, ades and other similar non-carbonated drinks, soda water and flavored carbonated drinks."
IOWA	August 1, 1979**	--minimum 5¢ deposit --minimum 1¢ handling fee --ban on sale of beverage containers with detachable pull-tabs --provides for the establishment of redemption centers --requires an annual transmittal of the first $100,000 of unredeemed liquor deposits to the State Substance Abuse Fund --containers must be labeled "Iowa Refund 5¢" in type at least 3 millimeters (9 point) in size	". . . alcoholic liquor, beer, mineral water, soda water or similar carbonated soft drinks."
MAINE	January 1, 1978	--minimum 5¢ deposit --minimum 2¢ handling fee --ban on sale of beverage containers with detachable pull-tabs --ban on sale of beverage containers connected by "plastic rings or material which does not decompose by photo-degradation, chemical degradation or biodegradation within a reasonable period of time upon exposure to the elements."	". . . beer, ale or other drink produced be fermenting malt, soda water or other nonalcoholic carbonated drink in liquid form."

*originally January 1, 1979
**deposit on liquor containers became effective May 1, 1979

MAINE (Cont'd)		--provides for the establishment of redemption centers --determines penalties for littering and requires that litter receptacles be placed in all public establishments --requires that the "refund value" be clearly embossed, imprinted or otherwise permanently affixed to the top of each beverage container	
MASSACHUSETTS	June 1, 1979	--ban on sale of beverage containers with detachable pull-tabs	". . . malt beverage or carbonated soft drink."
MICHIGAN	December 3, 1978	--minimum 5¢ deposit on "certified" containers, 10¢ on all others --bans sale of beverage containers with detachable pull-tabs --labeling requirements--refund value must be clearly embossed, stamped or otherwise affixed to the container --provides container certification standards --requires that dealers selling beverages for off-premise consumption provide a convenient means by which containers can be returned, and the deposit refunded. --provides for the establishment of regional redemption centers	". . . soft drinks, soda water, carbonated natural or mineral water, or other nonalcoholic carbonated drink; beer, ale or other malt drink of whatever alcoholic content
MINNESOTA	January 1, 1977	--ban on sale of beverage containers with detachable pull-tabs	". . . carbonated soft drink, beer, other malt beverage, or tea."
OHIO	July 1, 1982	--ban on sale of beverage containers with detachable pull-tabs	". . . beer, malt beverage, or mixed beverage as defined in Section 4301.01 of the Revised Code, or any soft drink as defined in Section 913.22 of the Revised Code." The term 'mixed beverage' is specified to include beverages containing alcohol. 'Soft drink' is defined as '. . . any nonalcoholic flavored carbonated beverage, soda, soda water, or fruitade, any nonalcoholic flavored still beverage, artificial waters whether or not carbonated, and bottled table waters, seltzer, or club soda."

OREGON	October 1, 1972	--2¢ minimum deposit on "certified" beverage containers, as defined in the Act, 5¢ on all others --ban on sale of beverage containers with detachable pull-tabs --exempts from the pull-tab ban the use of "pressure sensitive tape" --bans connecting devices for beverage containers which will not decompose within 120 days of disposal, either by chemical degradation, biodegradation or photodegradation --specifies that the refund value must be clearly indicated on the container --provides for the establishment of redemption centers, subject to the approval of the Oregon Liquor Control Commission	For application to deposit provisions: ". . . beer or other malt beverages and mineral waters, soda water and For application to pull tab provisions: ". . . any beverage in liquid form intended for human consumption."
SOUTH CAROLINA	July 1, 1980	--ban on sale of beverages with detachable pull-tabs	". . . carbonated soft drink or malt beverage."
VERMONT	July 1, 1975	--minimum 5¢ deposit --ban on sale of beverage containers with detachable pull-tabs and plastic or non-biodegradable connecting devices; provides exemption for pressure sensitive tape. --minimum 20% handling fee --provides for the establishment of redemption centers --includes provision for a public education program relating to the law --requires that the word "Vermont" and the refund value must be indicated on the container by either printing or embossing	For application to the pull-tab ban provision: ". . . all drinks sold in liquid form intended for human consumption." For application to the deposit provisions: ". . . beer or other malt beverages and mineral waters, soda water and carbonated soft drinks."
VIRGINIA	January 1, 1979	--ban on sale of beverage containers with detachable pull-tabs	". . . beer as defined in Sec. 4-2, paragraph 3. of the Code of Virginia or other malt beverages and mineral waters, soda water and formulated soft drinks, with or without carbonation."

Source: Can Manufacturers Institute

State Litter Abatement Law Summary -- 9/1/80

	ASSESSMENT SCHEDULE	PRODUCTS ASSESSED	PROVISIONS
ALASKA TITLE: "An Act relating to the reduction of litter and the recovery of materials and energy from litter; and providing for an effective date." EFFECTIVE DATE: July 1, 1980 ENFORCEMENT AGENCY: Department of Environmental Conservation	Not applicable	Not applicable	--$500,000 initial appropriation from the State General Fund --provides for annual Legislative appropriations thereafter --requires that the Department of Environmental Conservation prepare annual reports on the effectiveness of the law --provides for the encouragement of public anti-litter efforts --establishes an annual youth litter patrol --requires distribution of uniform litter receptacles and bags --specifies standards for distribution of grants --creates a seven-member advisory council, appointed by the Governor, to work with the Department of Environmental Conservation on implementation of the law --bans the sale of beverage containers with detachable pull-tabs and those connected by non-biodegradable devices
CALIFORNIA TITLE: "The Solid Waste Management Act of 1980" EFFECTIVE DATE: January 1, 1978 ENFORCEMENT AGENCY: Solid Waste Management Board	Not applicable--funds provided through a percentage of the incorporation tax paid by all corporations in the State.	Not applicable	--clean-up of recreational land and public roads --grants to eligible public and private entities to carry out litter clean-up programs --specifies standards for grantees --provides for the establishment of recycling centers and expansion of existing centers through coordination with the Solid Waste Management Board. --research and administrative support of the following programs: • litter collection • distribution of uniform litter receptacles and bags • enforcement of litter laws • resource and energy recovery from waste

COLORADO TITLE: "Colorado Litter Control Act" EFFECTIVE DATE: July 1, 1977 ENFORCEMENT AGENCY: Division of Local Government	Not applicable	Not applicable	--development of public educational programs relating to litter in the State --litter clean-up programs organized through public involvement as well as divisions of local government --distribution of uniform litter receptacles and bags --development of programs aimed at recycling of litter --provides for coordination between industry and government in anti-litter and recycling goals --terminates July 1, 1982 unless re-enacted
CONNECTICUT TITLE: "An Act Concerning Litter Control and Recycling" EFFECTIVE DATE: January 1, 1980 ENFORCEMENT AGENCY: Department of Environmental Protection	RETAILERS: $25-$300 per place of business, determined by annual sales, for those handling the identified products MANUFACTURERS, DISTRIBUTORS AND WHOLESALERS: $25-$3,000 for all places of business, determined by the number of employees within the State ranging from 1-19 to 1,000 or more $75-$9,000 for all places of business, determined by the number of employees within the State ranging from 1-19 to 1,000 or more, for those handling the identified products	RETAILERS: --grocery stores and supermarkets --take-out and fast food restaurants --retail liquor establishments --restaurants, taverns, cafes, hotels and motels --service station and auto-related businesses --drug and sundry stores --all other retailers and service firms MANUFACTURERS, DISTRIBUTORS AND WHOLESALERS: --glass --metal --plastic or fiber containers --liquor --newspapers and magazines --household paper and paper products --auto and truck tires --auto parts --beer and soft drinks --all others	--clean-up of State-owned recreational lands and public roads --clean-up and maintenance of property owned or leased by political subdivisions --grants to public agencies and private entities for the expansion of existing recycling centers and the establishment of new projects --establishment of youth litter corps for clean-up projects --purchase and distribution of litter bags and receptacles --implementation of an educational program aimed at increasing public awareness of litter and recycling programs --application of behavioral science techniques in litter control --supplemental enforcement of litter laws, including the hiring of additional personnel --money remaining in Litter Control and Recycling Fund not designated for expenditure prior to July 1, 1988 shall be transferred to the General Fund --bans the sale of beverage containers with detachable pull-tabs

[illegible] TITLE: "An Act Relating to Environmental Quality and [illegible] Control" EFFECTIVE DATE: January [illegible], 1979 ENFORCEMENT AGENCY: Department of Health	Not applicable	Not applicable	--allocation of $300,000 from the General Fund to implement the Act --empowers the Director of the Department of Health to: • coordinate state and local agencies to aid in litter cont efforts • implement study of available research on litter control, prevention, removal, disposal and recycling, and to ultimately institute those programs • conduct public education programs on the litter problem within the State • seek other funds or resources--either private or public--to aid in implementing requirements of the Act --bans the sale of beverage containers with detachable pull-tabs
NEBRASKA TITLE: "The Nebraska [illegible] Reduction & Rec[illegible], Act" EFFECTIVE DATE: October 1, 1979 ENFORCEMENT AGENCY: Department of Environmental Control	MANUFACTURERS & WHOLESALERS: $150 per $1,000,000 of gross proceeds on sale of specified products	--food for human consumption --pet food --groceries --cigarettes and other tobacco products --soft drinks and carbonated waters --beer and other malt beverages --household paper and paper products, excluding magazines, periodicals, newspapers, and literary works --glass containers --metal containers --plastic or fiber containers made of synthetic materials --cleaning agents and toiletries	--establishes public education, motivation and participation programs aimed at creating an anti-litter ethic in the state --improves enforcement of litter laws --establishes litter clean-up projects --develops new or improved community source separation and recycling programs --provides for survey of litter amount and composition on highways and urban areas within six months of effective date and follow-up studies--to be reported to the Governor --annual progress reports prepared on the law's effectiveness --establishment of youth litter patrols --establishes standards for uniform litter receptacles --sunset date of October 1, 1984
OHIO TITLE: "Ohio Litter Control & Recycling Program"	--an assessment on all corporations in the State, based on their corporate franchise tax rate, not to exceed $5,000 annually.	--intoxicating liquor, beer, malt beverages, wine, mixed beverages or spirituous liquor --glass, metal, plastic or fiber containers with capacity of less than 2 gallons	--establishment and maintenance of education programs to increase public awareness of litter problem and of importance of resource and energy conservation --coordination of activities within political subdivisions aimed at developing regional programs of litter control, resource recovery and conversion of litter and solid waste into energy

OHIO (Cont'd)	--all manufacturers and sellers of "litter stream products" are assessed an amount in addition to that noted above, also based on their corporate franchise tax rate, not to exceed $5,000 annually. Therefore, the *maximum* total tax liability for manufacturers and sellers of "litter stream products" is $10,000 annually.	-container crowns and closures -circulars and handbills used for distribution to the public -edible packaging used to wrap consumer goods -recapped rubber and retread tires	--provides assistance to political subdivisions in establishment of recycling centers --provides for grants to localities for programs specified in the law --bans the sale of beverage containers with detachable pull-tabs
SOUTH CAROLINA TITLE: "Litter Control Act of 1978" EFFECTIVE DATE: May 5, 1978 ENFORCEMENT AGENCY: Department of Health and Environmental Control	Not applicable	Not applicable	--establishes Litter Control Account to provide funds through contributions and an initial $500,000 appropriation from the General Fund --allows for annual appropriation by the General Assembly --provides for the coordination of local anti-litter efforts --establishes a statewide education program in elementary and secondary schools to create awareness of litter problems within the State --provides for the hiring of temporary employees specifically students, for participation in summer clean-up programs --requires a study on methods of implementation of litter reduction projects within the State --seeks cooperation of industry in anti-litter efforts of the Department of Health and Environmental Control --provides for a cost/benefit analysis of recycling litter --bans the sale of beverage containers with detachable pull-tabs

VIRGINIA TITLE: "Virginia Litter Control Act" EFFECTIVE DATE: July 1, 1976 ENFORCEMENT AGENCY: Department of Conservation and Economic Development	MANUFACTURERS, WHOLESALERS, DISTRIBUTORS & RETAILERS: $5 per establishment handling specified products OTHER: Excise tax on beer --1.2¢ per case (24/12) Excise tax on carbonated soft drinks-- $50-$6,000 determined by annual gross receipts, ranging from $100,000 or less to $10,000,001 or more	--food for human or pet consumption --groceries --cigarettes and tobacco products --soft drinks and carbonated waters --beer and other malt beverages --wine --newspapers and magazines --paper products and household papers --glass containers --metal containers --plastic or fiber containers made of synthetic materials --cleaning agents and toiletries --non-drug drugstore sundry items --distilled spirits --motor vehicle parts	--organiz... local anti-litter campaigns --investig... the availability of funds from private sources to be ... programs outlined in the law --allocat... to study available research on developmen of litter ... methods --investigat... methods and success of other techniques in contro... and possible development of those programs ... State --requires the ... tion of uniform litter receptacles and bo...
WASHINGTON TITLE: "Model Litter Control and Recycling Act" EFFECTIVE DATE: September 1, 1972 ENFORCEMENT AGENCY: Department of Ecology	MANUFACTURERS, WHOLESALERS & RETAILERS: $150 per $1,000,000 of gross proceeds of items specified	--food for human consumption --groceries --cigarettes and tobacco products --soft drinks, carbonated waters, beer and other malt beverages --newspapers and magazines --household paper and paper products --glass and metal containers --plastic or fiber containers made of synthetic materials --cleaning agents, toiletries and non-drug drugstore sundry products	--coordination of orga... volved in litter control --organization of volun... clean-up programs --anti-litter education p... --particular emphasis o... individuals to aid in develop... ment of recycling pro...

Can Manufacturers Institute
September, 1980

State	Litter Abatement/Recycling Laws	Forced Mandatory Deposits On Beverage Containers	Clean Community System And Others
ALABAMA	No Activity.	No Activity.	5 CCS Cities. 1 CCS County.
ALASKA	1979 - S.B. 1 introduced - failed to pass. Carried over to 1980 and passed by the Legislature. 1980 - Governor signed Litter Reduction Resource Recovery Act.	1978 - Mandatory deposit referendum defeated.	
ARIZONA	1979 - Senate Natural Resources Committee sponsored a litter control program resolution to be adopted. No movement. 1980 - Litter/Recycling Bill introduced. No movement.	1979 - Mandatory deposit legislation introduced and defeated in Committee. 1980 - Mandatory deposit legislation defeated in Committee.	Beverage Industry Recycling Program (BIRP).
ARKANSAS	No Activity.	1979 - Mandatory deposit legislation introduced. Died in Committee.	1980 - Governor's Advisory Council — Litter Control. 2 CCS Cities.
CALIFORNIA	1977 - Solid Waste Management Act passed. 1978 - Solid Waste Management Act implemented.	1975-1980 - Mandatory deposit legislation introduced consecutively for 5 years. 1980 Sacremento County Board of Supervisors considered mandatory deposit legislation. Board did not pass the initiative but put it on the ballot. July, 1980 - Board of Supervisors removed the initiative from the ballot.	15 CCS Cities.
COLORADO	1977 - Litter/Recycling Law introduced, passed and enacted. 1979 - State repealed funding of litter law.	1976 - Mandatory deposit referendum voted down 33%-67%.	6 CCS Cities

State	Litter Abatement/Recycling Laws	Forced Mandatory Deposits On Beverage Containers	Clean Community Systems And Others
CONNECTICUT	1978 - Litter/Recycling Law passed. 1980 - Litter/Recycling Law implemented.	1978 - Mandatory deposit bill passed. 1980 - Mandatory deposit law implemented.	
DELAWARE	No Activity.	1978 - Passed mandatory deposit law with contiguous states language in effective date. 1979 - Bill introduced to remove contiguous language. Carried over to 1980. 1980 - H.B. 688 failed to remove the contiguous states language.	
FLORIDA	No Activity.	1979 - Mandatory deposit bill defeated in Subcommittee.	4 CCS Cities.
GEORGIA	1979 - Litter abatement law introduced. Failed to pass prior to adjournment.	No Activity.	1978 - Statewide CCS.
HAWAII	1977 - Environmental Quality Litter Control Law passed. 1979 - Environmental Quality Litter Control Law implemented.	1978 - Deposit legislation introduced. Died in committee.	
IDAHO	No Activity.	No Activity.	3 CCS Cities.
ILLINOIS	1979 - Litter bill introduced. No action. 1980 - Litter bills carried over either tabled, defeated.	1979 - deposit bill introduced. No action.	1 CCS City.
INDIANA	1979 - Litter bill introduced but not acted upon.	1979 - Deposit legislation died with adjournment.	6 CCS Cities.
IOWA	No Activity.	1978 - Deposit bill passed and signed by Governor. 1980 - Law specified that the handling fee be retained at 1¢ per container. The original 1978 law specified that after 2 years of law, handling fee be reduced to 1/2¢ per container.	6 CCS Cities.

State	Litter Abatement/Recycling Laws	Forced Mandatory Deposits On Beverage Containers	Clean Community Systems And Others
KANSAS	No Activity.	1979 - Deposit bill introduced and defeated.	3 CCS Cities.
KENTUCKY	1978 - Resource Conservation Recovery and Beautification Act enacted. Assessment was only on wholesalers and manufacturers (excluded retailers) of 16 identified product categores. 1980 - Supreme Court found that assessment to be discriminatory and ordered funds collected to be returned.	No Activity.	6 CCS Cities.
LOUISIANA	1979 - Litter bill passed Committee but no action on the floor prior to adjournment. 1980 - Four Litter Bills introduced. One passed House but failed to pass Senate before adjournment.	1979 - Deposit bill reported unfavorable. 1980 - Deposit bill killed in Committee.	1 CCS City.
MAINE	No Activity.	1976 - Mandatory deposit referenda passed. January, 1978 - Mandatory deposit law became effective. 1979-1980 - Amendment enacted increasing handling fee to 20% minimum. 1979 - Referenda to repeal mandatory deposit law turned down.	
MARYLAND	1979 - Litter Bill defeated. 1980 - Litter Bill defeated.	1975 - Montgomery County Council has a deposit ordinance on the books but the Council has not implemented it. 1978 - Howard County mandatory deposit referendum defeated 36%-64%. 1980 - Deposit bill defeated on House floor.	Beverage Industry Recycling Program (BIRP).

State	Litter Abatement/Recycling Laws	Forced Mandatory Deposits On Beverage Containers	Clean Community Systems And Others
MASSACHUSETTS	1978 - Litter Bill - No action. 1979 - Litter Bills introduced. Hearings held. No action taken. 1980 - Litter Bill died with adjournment. 1980 - Establishment of Corporation for a Cleaner Commonwealth by Governor. Funding for 1 year.	1976 - Mandatory deposit referenda defeated - 49%-51%. 1977 - Deposit bill introduced - failed to pass. 1978 - Deposit bill introduced - failed to pass. 1979 - Deposit bill passed House & Senate. Governor vetoed.	2 CCS Cities.
MICHIGAN	No Activity.	1976 - Mandatory deposit referenda passed. 1979 - Mandatory deposit law implemented.	2 CCS Cities.
MINNESOTA	1978 - Litter Law carried over to 1979. No movement.	1978 - Deposit bill carried over to 1979. No movement. 1980 - Deposit bill introduced. No action reported on bill prior to adjournment.	1 CCS City.
MISSISSIPPI	No Activity.	1980 - Deposit bill died in Committee.	3 CCS Cities.
MISSOURI	1979 - Litter Bill introduced. No action taken.	1979 - Deposit bill introduced. No action taken.	2 CCS Cities.
MONTANA	No Activity.	1979 - Deposit bill defeated in House. 1980 - Initiative #87.	
NEBRASKA	1979 - Litter Bill introduced, passed and enacted. 1980 - Introduction of repeal of Litter Law failed to get out of Committee.	1978 - Mandatory deposit referenda defeated 43%-57%.	Statewide CCS.
NEVADA	No Activity.	No Activity.	1 CCS City.
NEW HAMPSHIRE	1979 - Litter Bill defeated in Committee.	1979 - Deposit bill defeated in Committee by vote.	

State	Litter Abatement/Recycling Laws	Forced Mandatory Deposits On Beverage Containers	Clean Community Systems And Others
NEW JERSEY	1979 - Litter Abatement measure introduced but failed to pass prior to adjournment.	1979 - Deposit bills introduced. No action. 1980 - Deposit bills introduced. Hearings held - no action.	4 CCS Cities.
NEW MEXICO	No Activity.	No Activity.	3 CCS Cities.
NEW YORK	No Activity.	1979 - Deposit bill introduced. Killed in Committee. 1980 - Deposit bill introduced. Defeated in Committee. Others still pending.	2 CCS Cities.
NORTH CAROLINA	1979 - Litter Abatement Bill was not acted upon. 1979 - Two bills introduced. Waste product recycling fund implemented with State funds. No action.	1979 - Deposit bill died in Committee upon adjournment.	6 CCS Cities. 6 CCS Counties.
NORTH DAKOTA	1979 - Litter Abatement - no action reported prior to adjournment.	No Activity.	1 CCS City.
OHIO	1979 - Litter Abatement/Recycling Law was introduced. Carried over to 1980. 1980 - Passed Legislature and was signed by the Governor.	1979 - Mandatory deposit initiative to Legislature. Legislature had 4 months to act upon it and failed to do so. Proponents gathered additional signatures needed to place Deposit Bill on November ballot. November, 1979 - Deposit bill defeated in all 88 counties - 28%-72%.	5 CCS Cities.
OKLAHOMA	No Activity.	1979 - Development of Study group to analyze deposit legislation in other states.	3 CCS Cities.
OREGON	No Activity.	1972 - Mandatory Deposit Law implemented. 1979 - Amendments to Oregon Mandatory Deposit Law to add handling fee and increase the deposit introduced. Was not enacted.	

State	Litter Abatement/Recycling Laws	Forced Mandatory Deposits On Beverage Containers	Clean Community Systems And Others
PENNSYLVANIA	1980 - Litter/Recycling Bill introduced. No action.	1979 - Deposit bill introduced. No action. Carried over.	
PUERTO RICO	No Activity.	No Activity.	
RHODE ISLAND	1979 - Litter Bill. No definitive action taken.	1979 - Deposit bills introduced. Rhode Island "Bottle Bill" Commission voted 8-5 against recommendation of mandatory deposit legislation. House H W voted 10-5 against passage of two deposit bills based upon recommendation of the Commission. 1980 - Deposit bill died with adjournment of the Legislature. Deposit bill called for a referendum. Passed out of Committee; passed House; Senate Chairman defeated.	
SOUTH CAROLINA	1978 - Litter Control Act passed. May 5, 1978 - Litter Control Act implemented.	No Activity.	6 CCS Cities.
SOUTH DAKOTA	No Activity.	No Activity.	2 CCS Cities.
TENNESSEE	1979 - Litter/Recycling bill heard in Committee but failed to pass. 1980 - Litter Bills voted out of Committee but no action taken by full House. 1980 - Governor committed a comprehensive statewide litter control program. Details to be announced in October, 1980.	1980 - Deposit laws introduced. Killed by Committee vote.	4 CCS Cities.
TEXAS	No Activity.	1979 - Mandatory deposit bill died with adjournment.	19 CCS Cities.
UTAH	No Activity.	No Activity.	

State	Litter Abatement/Recycling Laws	Forced Mandatory Deposits On Beverage Containers	Clean Community System And Others
VERMONT	No Activity.	1975 - Mandatory deposit law became effective. 1980 - Amendment to original law - handling fee being raised to 2¢ per container.	
VIRGINIA	1975 - Virginia Litter Control Act passed. July, 1976 - Litter Control Act implemented.	1976 - Fairfax County Deposit Ordinance passed by Board of Supervisors. August 28, 1980 - Virginia Supreme Court ruled that the Fairfax County Board of Supervisors did not have the authority to enact the ordinance requiring a 5¢ deposit on carbonated beverage containers. August 28, 1980 - Virginia Supreme Court also found that Loudoun County's Board of Supervisors acted beyond its authority in placing a deposit on beer containers sold within the County. Loudoun's deposit on soft drink containers was not an issue in the case, and was therefore not addressed.	11 CCS Cities. 10 CCS Counties.
WASHINGTON	1971 - Model Litter Control & Recycling Act introduced, passed and signed. 1972 - Model Litter Control & Recycling implemented.	1970 - Mandatory deposit referendum defeated. 1979 - Mandatory deposit Initiative qualified and sent to Senate. Senate vote 10-3 against passage of bill. Killed in Rules Committee. 1979 - Statewide mandatory deposit initiative defeated 42%-58%.	1 CCS City.
WEST VIRGINIA	No Activity.	1979 - Deposit bill introduced. No action. 1980 - Deposit bill introduced. No action.	2 CCS Cities.
WISCONSIN	1980 - Litter bill introduced. Hearing held. Voted to take no action at this time.	1978 - Stevens Point referendum defeated. 1979 - Deposit bills introduced and carried over to 1980. 1980 - Committee on Environmental Resources reviewing other deposit law states.	
WYOMING	No Activity.	1979 - Deposit bill killed with adjournment.	1 CCS City.

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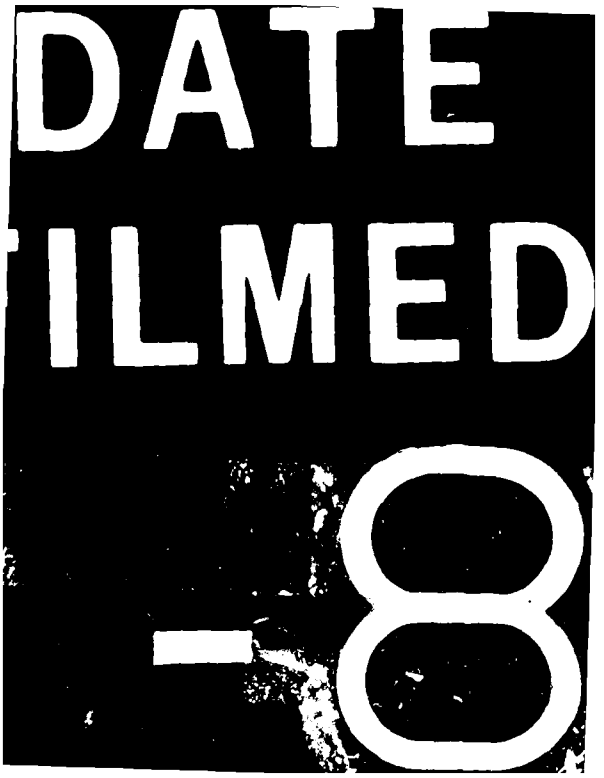
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